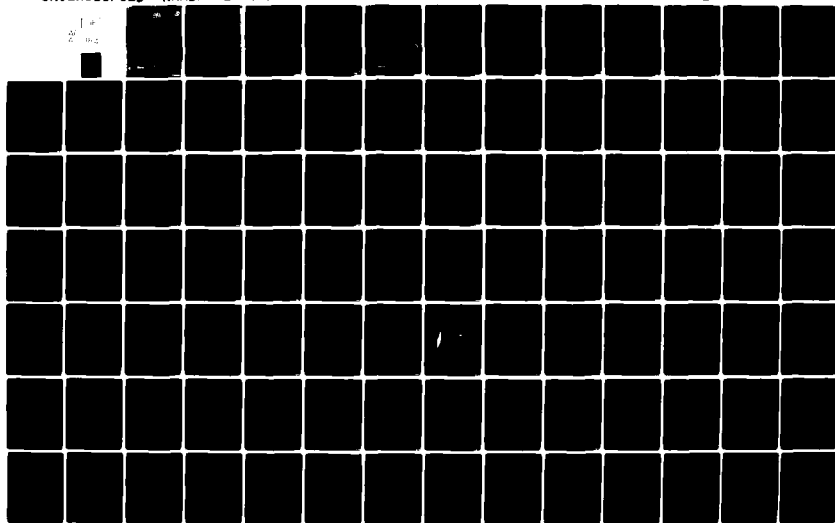
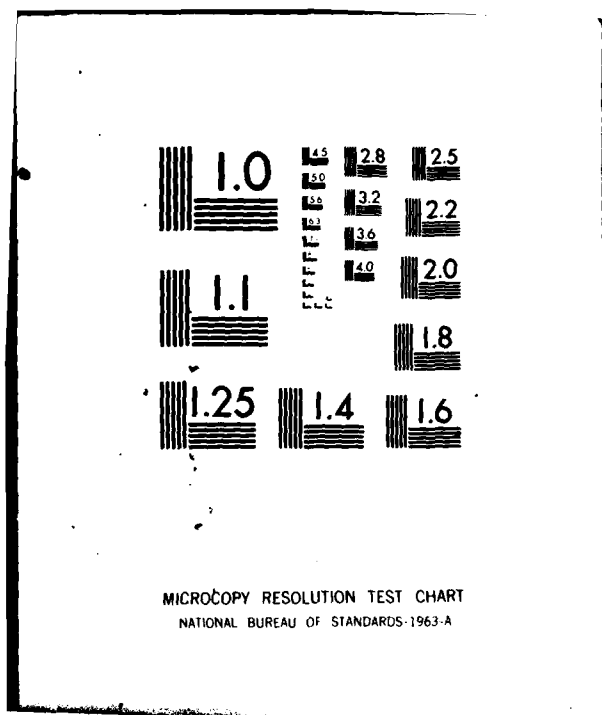


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N-1476-AP Air Force Manpower, Personnel, and Training System: Volume II: Analysis of the Enlisted Authorization/Assignment and Manpower Requirements/Personnel Objectives Subsystems.\*  
B. E. Armstrong, S. W. Chapel, S. C. Moore. May 1980.

Describes evaluation of two subsystems for enlisted force management: a short-term or "programming" subsystem and a long-term or "planning" subsystem. The short-term subsystem is evaluated by comparing personnel assignments in about two hundred occupational specialities over a three and one-half year period. The statistical methods employed should be useful in developing more detailed comparisons within occupations (i.e., authorization-assignment agreement according to skill level, pay grade, command, etc.) The long-term subsystem is evaluated by reviewing its logical and operational structure. While its many strengths are apparent, the subsystem is somewhat lacking in integration, largely because it lacks effective focus on cost and productivity characteristics associated with different types of people (e.g., experienced versus inexperienced people within different occupations.) We recommend that practical mechanisms be developed which will permit (1) identification of multiple manpower/personnel force structures (within occupations and forcewide) capable of meeting mission requirements and (2) evaluation of/selection among these alternatives. 118 pp. Ref. (Author)

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## A RAND NOTE

AIR FORCE MANPOWER, PERSONNEL, AND TRAINING  
SYSTEM: VOLUME II--ANALYSIS OF THE ENLISTED  
AUTHORIZATION/ASSIGNMENT AND MANPOWER REQUIRE-  
MENTS/PERSONNEL OBJECTIVES SUBSYSTEMS

B. E. Armstrong, S. W. Chapel, S. C. Moore

May 1980

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Prepared For

The United States Air Force

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**Rand**  
SANTA MONICA, CA. 90406

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## PREFACE

Recent specialized studies of aircraft maintenance, training system acquisition, and personnel systems (conducted by the U.S. Air Force, The Rand Corporation, and other institutions) have noted the fundamental and complex organizational and functional interdependencies existing in "the system" that defines requirements for manpower, establishes personnel plans and policies, and recruits, trains, and assigns individuals to work units. Rand established the "Manpower, Personnel, and Training Dynamics Study" within the Project AIR FORCE Manpower, Personnel, and Training Program to address these interdependencies. The objective of the study is to promote the control of enlisted manpower costs, the enhancement of labor productivity through improved responsiveness to changing environments, and a better integration of manpower, personnel, and training planning and evaluation. Major tasks within the study are designed to document the Air Force's overall enlisted force management system (referred to as the Manpower, Personnel, and Training, or MPT, system), to examine the dynamic behavior of the MPT system by analyzing historical data, and to propose alternative operational strategies that would improve the MPT system.

This Note--the second volume of a two-volume series-- documents the results of the second and third tasks. The first volume (R-2429-AF) presents the results of the first task, an integrated discussion of the roles and interactions of the organizations and processes constituting the system.



Large portions of the "manpower" and "personnel" components of the MPT system, organizationally separate when the system description was developed (about 1977-78), have since been drawn together under a common Deputy Chief of Staff/Manpower and Personnel (AF/MP). To date, this reorganization, while involving several changes in title, responsibility, and authority, seems to have had relatively little effect on the functioning of the system. Since they relate much more to functions than to organizations, the findings of the present studies should remain valid; only an occasional title change has been required to keep the text current.

This work was conducted for the Directorate of Personnel Plans and the Directorate of Manpower and Organization, Hq USAF. The Note addresses issues that commonly confront these organizations. The conclusions and recommendations provide a perspective for USAF management improvement and action.

SUMMARY

This Note breaks the overall USAF manpower, personnel and training (MPT) system, documented in the companion volume (R-2429-AF), into two subsystems: (1) an authorization/assignment subsystem and (2) a manpower requirements/personnel objectives subsystem. The first subsystem focuses on the short term; it allocates authorizations in accordance with manpower requirements and budgetary limitations and it recruits, trains, and assigns people to fill authorized positions. The second subsystem focuses on the long term; it develops operational manning guidelines and overall workforce structure plans and personnel policies.

Our approach here is evaluative. The purpose is to combine understandings obtained during our system-descriptive work, inferences drawn from readily available historical data, and logical criticisms of the system's operation to identify promising areas for system improvement and/or research. The perspectives provided by reviewing the MPT system from these short-term and long-term viewpoints permit identification of important interrelationships among system components which might otherwise go unnoticed.

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### THE AUTHORIZATION/ASSIGNMENT SUBSYSTEM

The authorization/assignment subsystem is analyzed primarily by comparing the number of people assigned in each of about 200 occupational specialties to the number actually authorized. These comparisons cover the period from January 1974 to May 1977, a time of steady decline in the total size of the enlisted component. The ideal would be for the subsystem to result in an exact match of assignments to authorizations for each occupation. We examine, therefore, the degree of imbalance (disagreement in the level of authorizations versus assignments) which we characterize as chronic overmanning (a state of persistent excesses of assignments), chronic undermanning (a state of persistent shortages of assignments), or nonchronic (a close match between authorizations and assignments). We find that:

1. Total imbalances (assignment excesses plus shortages) amounted to about 6 percent of the total authorizations.
2. About two-thirds of the total imbalance was due to overmanning in occupations.
3. The undermanning imbalances declined (in terms of the percentage of occupations exhibiting undermanning) by about one-fourth over the three and a half year period.
4. About one-fourth of the occupations experienced chronic imbalances over the study period.
5. Chronically overmanned occupations tended to include those being more critical to Air Force flying missions and those having longer training requirements (suggesting intentional oversupply of these occupations).
6. Chronically imbalanced occupations tended to be smaller and changed size more rapidly (either growing or shrinking), and they exhibited greater variation from period to period in their authorization levels.

These findings support a conclusion that the authorization/assignment subsystem succeeds rather well in supplying/assigning appropriate numbers of personnel to individual occupations. There is evidence that some occupations are chronically imbalanced, but the MPT system components appear sensitive to this situation; they provide more accurate advance projections of authorizations and produce assignments that more closely parallel the authorization levels for these occupations. But discrepancies, perhaps due to sudden changes in authorization levels or retention behavior, persist over time.

The conclusion is limited to the matching of authorizations and assignments in aggregate (by entire enlisted occupation) because of data limitations. The question of the degree of agreement between authorizations and assignments at more detailed levels (commands, bases, skill levels, and so on) is addressed herein only briefly and qualitatively.

#### THE MANPOWER REQUIREMENTS/PERSONNEL OBJECTIVES SUBSYSTEM

The manpower requirements/personnel objectives subsystem embodies a number of significant strengths; e.g., the formal Management Engineering Program, a wide variety of available operational and personnel data, and expertise in creating and using computerized force planning models. But the subsystem also has limitations. For example, long-run personnel force structure plans are determined without regard for projected requirements for specialists at the three lowest skill levels. Also, manpower requirements within specialties are based primarily on past manning practices and productivities. Further, only sporadic

attention is focused on aspects such as the personnel job classification scheme or manpower utilization policy changes which would allow more senior enlisted personnel to continue working as technical specialists rather than requiring their transition into management roles. Such limitations, we believe, may be partially manifest in collateral systemic problems such as cost overruns, failure to meet production objectives, excessive overtime, recurring necessities for high-level decisions to make across-the-board personnel or program reductions, and the loss of valuable senior technicians.

More succinctly, we find that the manpower requirement/personnel objectives subsystem is somewhat lacking in integration, largely because it lacks mechanisms which focus on costs and productivity. Specifically, it lacks the ability to evaluate possible redistributions of force strength among distinct manpower categories within and between specialties. The requirements determination process generates manpower standards prescribing just one personnel configuration for each possible unit workload, and the force planning process generates just one objective force structure. Differences in the capabilities and costs of different categories of manpower either are not considered or their consideration occurs too late in both processes to significantly affect the selected unit and force configurations. This prevents the components of the MPT system from evaluating alternative configurations which might (1) increase output at the same cost or (2) reduce cost while maintaining the desired output.

## RECOMMENDATIONS

Our recommendations pertain to both subsystems. First, regarding the authorization/assignment subsystem, we recommend that statistical methods, like those employed here to assess the occupation-wide agreement between authorizations and assignments, be extended and applied to assess the agreement between authorizations and assignments and standard-recommended manning at more detailed levels: for individual skill levels and pay grades within occupations, within operating commands, and within work centers. Such comparisons are likely to reveal much larger relative discrepancies than observed in our work and provide explicit data relevant to several important considerations--e.g., the "clout" commanded by manpower standards, potential needs for manpower standard revision, shortfalls in workforce capabilities which may be present in particular operational functions, and the relative priorities accorded the various occupations, work centers, and commands.

Second, to provide the manpower requirements/personnel objectives subsystem with the enhanced capability to identify and take advantage of the cost and productivity differences that exist among different types of personnel, we believe that the subsystem should be extended in two dimensions. First, systematic means should be developed for identifying alternative unit manning configurations capable of performing the same amount of work. These configurations would vary according to experience, skill level and/or occupation, and unit size. This should provide the subsystem with information concerning the relation-

ship of work unit capability and personnel experience. Only a few manning alternatives at the work center level translate into myriad possibilities at the forcewide level. Second, force planning techniques should be devised which can use economic criteria to select among these forcewide manning alternatives. These techniques should provide the capability to identify alternative force structures which capitalize on current and projected manpower availabilities and to evaluate potential economic effects of grade-ratio and end-strength limitations on these alternatives. The essence of these alternative operational strategies is to highlight the relationships among force capabilities, force structures, and costs. The objective is to focus attention on capability and costs within a framework which will preserve the career opportunity, vigor, and experience of the enlisted force.

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The authors are especially indebted to William Albright, C. Robert Roll, Jr., and John Rolph, who have provided insights and criticisms that have significantly influenced the directions of this research and the final form of this Note.

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## I. INTRODUCTION

The enlisted manpower component of the United States Air Force currently numbers about 450,000. Approximately 70,000 new personnel are added each year and a similar number are separated, including about 8,000 who retire. This enlisted force is subdivided into groups representing over 300 occupations, 5 skill levels, 9 grades, up to 30 years of service, and up to 18 years of experience in some grades. Further, this force is spread over more than 20 different commands and separate operating agencies, about 150 bases, and approximately 10,000 distinct work centers.

Maintenance of the force is further complicated by a "constant state of change" due, for example, to variations in missions, weapon systems, operating philosophies, budgets, wages, public attitudes, and recruitment pool sizes. Each person in the enlisted force must be recruited, trained, assigned, employed, developed, and eventually separated in ways acceptable to him as an individual and supportive of USAF mission objectives. The Air Force manpower, personnel, and training functional components are charged with the responsibility for management and performance of these Herculean tasks.

This Note examines the Air Force's "Manpower, Personnel, and Training (MPT) System," the complex of people, policies, and procedures which are employed to manage its enlisted manpower resources. While the companion report, R-2429-AF, Air Force Manpower, Personnel, and Training: Roles and Interactions, by Armstrong & Moore, 1980, is primarily descriptive of this vast system, the current volume adopts an evaluative viewpoint. The

purpose here is to combine understandings obtained during our descriptive work, inferences which can be drawn from readily available historical performance data, and logical criticisms of the system's integration/operation to identify promising areas for system improvement and/or research.

The overall study was undertaken because Rand researchers and Air Force managers and analysts perceived the complexity of the MPT system and the manner in which individual aspects of the overall system (e.g., job classification, recruitment, training requirements, retention behavior, and promotion policies) continually influence each other. The Rand project, "The Manpower, Personnel, and Training Dynamics Study," which produced this Note, was undertaken to assemble an understanding of the integrated nature of the overall MPT system. The companion volume describes the system straightforwardly so that others--besides those few who have had operational and/or management responsibilities in all three components[1] --can understand it.

Comprehension of this overall MPT system brings a considerable appreciation for its sophistication and soundness. Critical evaluation, however, leads to identification of areas in which significant improvements appear to be possible. We begin here by presenting a conceptual division of the system into two interrelated subsystems and describing appropriate evaluative approaches

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[1] Previously, the three components were organizationally distinct. Recently, however, a major reorganization has joined the manpower and personnel functions under a common Deputy Chief of Staff for Manpower and Personnel. The training organization, the Air Training Command, remains separate.

for each. Subsequent sections review each subsystem and provide evaluation discussion sufficient to lead to the final section, a description of recommended research and development activities.

#### SUBDIVIDING THE MPT SYSTEM

As noted, R-2429-AF provides a "snapshot" (circa 1977-79) of the Air Force's MPT system. Its descriptive approach presents the roles of the manpower, personnel, and training components and then addresses the interactions among the three components. It pays special attention to the processes and policies followed by each component, the organizational levels where particular responsibilities are located, and the occurrence of events over time. Figure 1 represents a summary of the overall system. Observe that three cycles of the planning, programming, and budgeting system (PPES) are depicted, spanning about 15 months.

For our purposes, it is advantageous to consider just one of these cycles, as depicted in Figure 2. In this simplified representation, the administrative level (i.e., base, command, Air Staff, secretarial) designations are deleted and strict adherence to the time scale is relaxed, facilitating our concentration on the system's major functions and activities. As indicated in the figure, we have subdivided the total system into two subsystems: a manpower requirements/personnel objectives subsystem and an authorization/assignment subsystem. This dichotomy appears more appropriate than an organizationally-based division because all three components engage in two fundamentally different kinds of activity, one oriented towards the long-term (i.e., planning how the force should be structured after the next

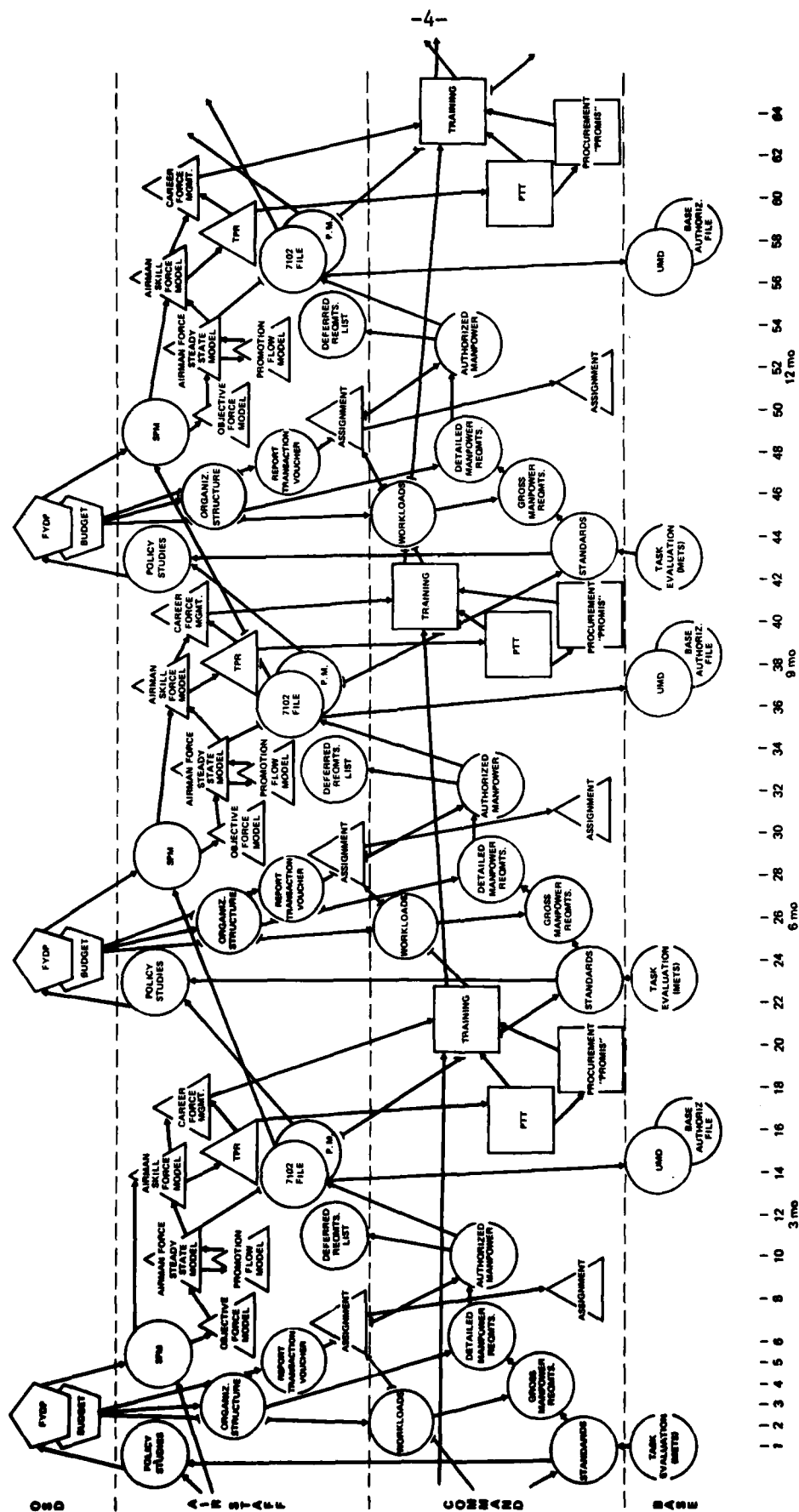


Fig. 1 — The overall manpower, personnel, and training system.

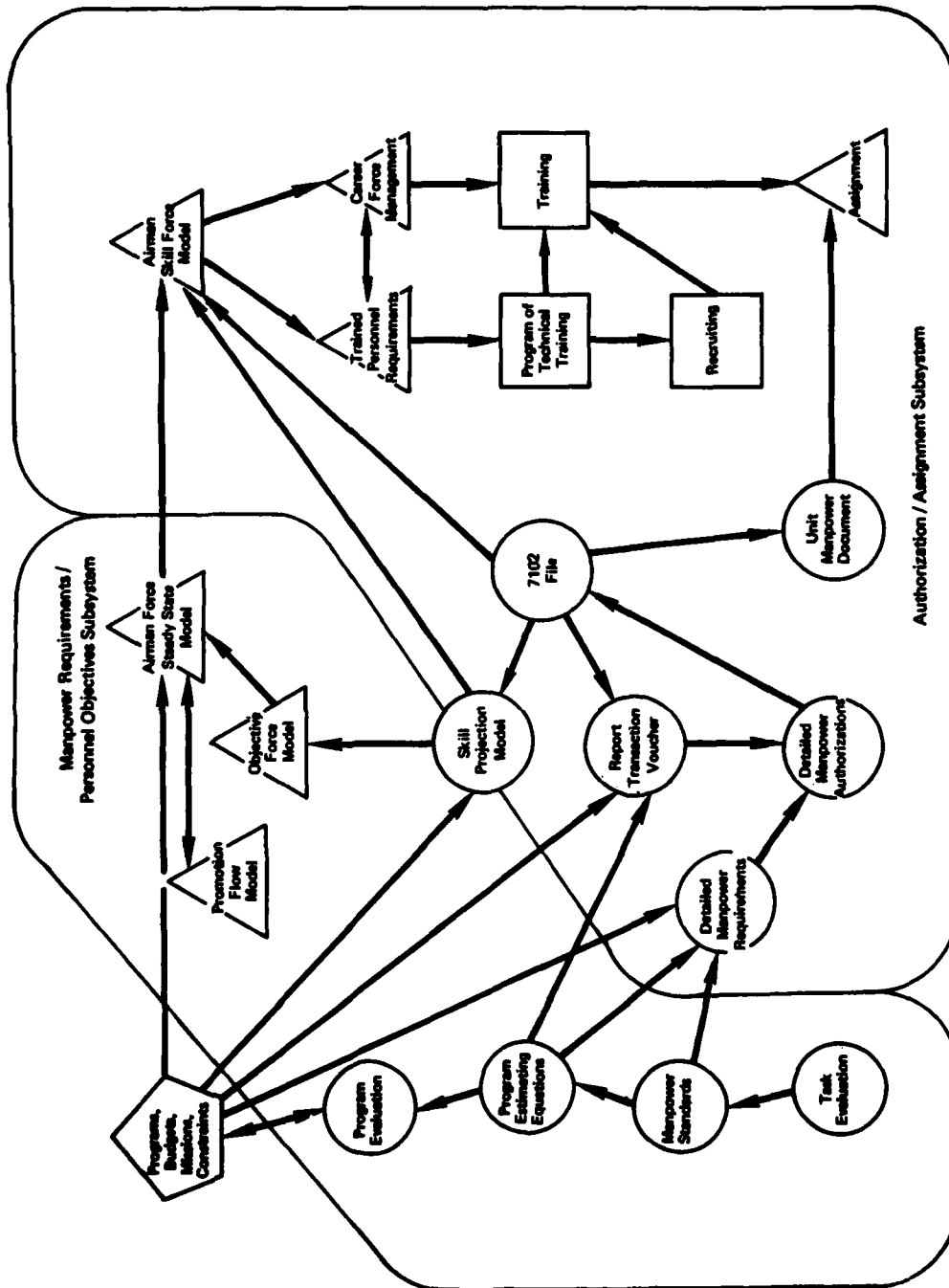


Fig. 2 — The single-cycle manpower, personnel, and training system



several years) and the other oriented towards the short term (i.e., programming the management of the force during the current and the next few years). For example, tasks typically considered as personnel responsibilities include the establishment of long-term force structure plans as well as the continuous assignment of individuals to duty locations. Manpower, similarly, defines and promulgates long-run work standards and standard manning configurations as well as regularly allocating authorized manpower levels among commands and bases. Training responsibilities tend to concentrate in the relative short term, largely because recruitment, training, and crosstraining provide the principal means for accommodating short-term changes in manpower supply and demand. But longer-term implications for training are occasionally considered, for example, when possible changes in the personnel classifications system are analyzed.

This subdivision of the overall MPT system into a manpower requirements/ personnel objectives process and an authorization/assignment process dictates the structure of this paper. We conclude this first section with a brief discussion of evaluation approaches and their appropriateness for each of these subsystems. The sections following contain abbreviated descriptions of each subsystem along with relevant evaluative discussion. We discuss the authorization/assignment subsystem first since it must operate within certain constraints dictated by the manpower requirements/personnel objectives process and since we undertook its evaluation first. Its analysis, then, provides the context and some of the motivation for our consideration of the

manpower requirements/personnel objectives process. We conclude with our recommendations for development of system improvements and for further evaluative investigation.

#### EVALUATION ISSUES

Numerous approaches can be taken in systems evaluation.

Primary among these are:

- (1) Outcome evaluation: assessment of adequacy and desirability of the system's "products."
- (2) Cost evaluation: analysis of costs associated with system operation (e.g., estimation for each occupational specialty of costs per authorization, per recruit accessed, per individual trained, or per person assigned).
- (3) Cost-effectiveness/cost-benefit: comparison of the value of the system's results against its cost.
- (4) Process evaluation: analysis of the system's structure to determine the extent to which its mechanisms and operations are utilized, coexist compatibly, and mutually support achievement of system objectives.

In the assessment of the authorization/assignment subsystem, it seems particularly appropriate to employ outcome evaluation. The subsystem's primary objectives are to (1) allocate approved authorizations to programs, commands, bases, and work centers and (2) assign individuals to fill authorized positions. Thus, a straightforward measure of system performance is the degree to which assignments have historically matched authorizations--often referred to as "the matching of faces to spaces."

The principal products of the manpower requirements/personnel objectives subsystem are personnel planning policies (e.g., objective experience and grade distributions for groups of AFSCs called career progression groups) and

manpower requirements guidelines (e.g., recommended unit manning configurations for different types of work centers). In the sense that we can examine these outputs, looking for certain desirable characteristics, we can also use outcome evaluation in this setting--although not in the quantitative way that is possible for the authorization/assignment subsystem. At the same time we can employ process evaluation by considering the sequence and mechanics of the steps involved in the manpower requirements/personnel objectives subsystem.

Information necessary for a comparison of the MPT system costs and corresponding benefits was not available nor did it seem particularly appropriate since this research focuses on the system's operations and performance.

## II. THE AUTHORIZATION/ASSIGNMENT SUBSYSTEM

### ABBREVIATED DESCRIPTION

Figure 3 is a flow diagram depicting the authorization/assignment subsystem and some of its relationships to the manpower requirements/personnel objectives subsystem. The authorization/assignment subsystem is a short-term management system used to control the provision and distribution of enlisted personnel resources. The system accepts manpower requirements and personnel objectives as fixed. Managers endeavor to distribute manpower authorizations and to recruit, train, retrain, assign, and separate individuals so that manpower requirements are met equitably, budget levels are not exceeded, etc.

We observe in Fig. 3 that the authorization/assignment subsystem receives two primary inputs from the manpower requirements/personnel objectives subsystem: manning guidelines and personnel objectives. Manning guidelines, in the form of Program Estimating Equations (PEEs) and manpower standards, delineate recommended manning associated with specified program activities and corresponding workloads. They facilitate the determination of manpower allocations among commands, bases, work centers, and even skill and grade levels. Personnel objectives take the form of force profiles (e.g., numbers of personnel by years of service, occupational specialty, and skill level), reenlistment targets, promotion quotas (grade guides), etc., and are generated by Air Staff personnel using computerized planning models. These personnel objectives are based on skill level

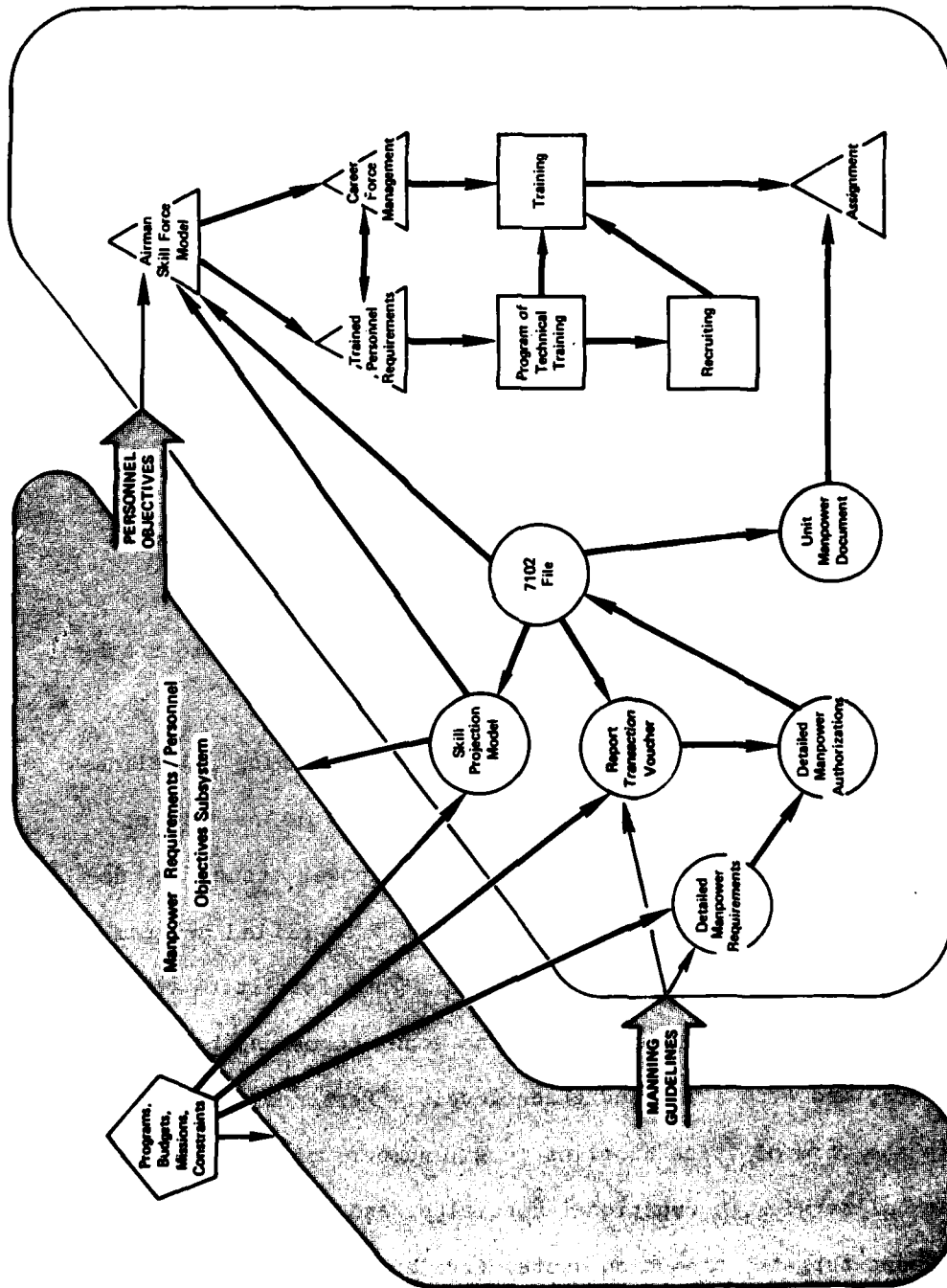


Fig. 3 — The authorization / assignment subsystem

requirements obtained using the Skill Projection Model, [1] loss rates obtained from the Uniform Airman Record (UAR) and the Gain/Loss Transaction File, and management assessment of acceptable personnel policies and force evolution.

The authorization/assignment system also receives annual program plans, in the Five-Year Defense Plan (FYDP), which largely dictate its near-term manpower, personnel, and training decisions.

Within the authorization/assignment subsystem, the three basic activities are (1) detailed allocation of authorizations to commands, bases, and work units, (2) acquisition and training of appropriate personnel, and (3) assignment of these individuals to bases and work units. Let us summarize each in turn.

The Report Transaction Voucher document lists authorized manpower by program, skill type, and grade; it essentially represents a budget constraint for each command. This allocation is based on Air Staff assessment of mission and function priorities, Congressional budgetary and manpower allotments, interpretation of historical requirements, and simple proration. The commands themselves then allocate authorizations further to bases and individual units (often while negotiating for adjustments in their own allocations). Thus, the activity of allocating authorizations occurs at both the Air Staff and command levels.

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[1] See, for example, Michael J. Mestrovich, "The Airman and Officer Skill Projection Model, Volume I: Management Summary," USAF Manpower Research and Analysis Group, the Pentagon, June 1973.

Detailed authorization levels (by specialty, skill level, and grade) are specified for each base in the form of unit manpower documents. The "7102 File," updated and reviewed by the Air Staff, constitutes the authoritative record of manpower authorizations. It also contains projections of future manpower requirements.

To ascertain personnel recruitment and training requirements, the Airman Skill Force Model (in conjunction with the Airman Force Program and Longevity Model) is employed to analyze current strength, anticipated authorizations (determined by extrapolating recent authorization patterns using the Skill Projection Model), loss rates, promotion and retraining quotas, etc. The resulting personnel requirement projections are grist for the quarterly Trained Personnel Requirement (TPR) Conference. At this conference, attendees use information such as impending program changes, discrepancies between expected and requested authorizations, and recruitment and training resources and likelihoods to revise projected personnel requirements. The resulting schedule of requirements, referred to as "the TPR," forms the basis for planning training courseloads, schedules, instructor assignments, etc. The Air Training Command publishes such plans quarterly in the Program of Technical Training, essentially a two-year projection of new manpower supply for each specialty. Then, of course, actual recruiting and training must be coordinated so that "production" objectives are met. Finally, the USAF

Manpower Personnel Center (MPC)[1] endeavors to match existing personnel resources to manpower authorizations (by skill type, skill level, and grade).[2] Records of airman assignments are maintained in the Uniform Airman Record.

Manpower authorizations are typically specified without regard to existing or projected manpower supplies. It should be clear from the previous process description, however, that projected authorization levels are an important element in generating recruitment, training, retraining, and retention targets and hence in the determination of assignment levels.

As already previewed, our analysis of the authorization/assignment subsystem is focused on the outcome ideal: agreement between authorizations and assignments. It is clear that disagreements between assignments and authorizations can have very serious ramifications. Underassignment--assigning fewer people than authorized--can inhibit force performance and jeopardize mission accomplishment. Overassignment, on the other hand, potentially contributes to personnel underutilization and economic waste.[3]

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[1] Formerly entitled the USAF Military Personnel Center.

[2] In this role MPC has been likened to a clearinghouse.

[3] These general statements, of course, assume that authorization levels are "correct"--i.e., they represent the manning levels which can best meet program objectives within existing budget limitations. As indicated in sections III and IV of this report, however, we contend that authorization level specifications can be improved, for example, by considering personnel costs more completely and by examining alternative configurations of manpower (and equipment) in accomplishing particular functions. But regardless of how authorization levels are determined, it is still necessary to match people to them.



In summary, the overall objectives of the authorization/assignment subsystem can be stated, albeit crudely, as:

- (1) distributing budget-approved total manpower authorizations so that mission objectives can best be met,
- (2) "producing" individuals (human resources) with the proper levels of experience and training to perform assigned tasks effectively, and
- (3) distributing these individuals among the work centers requiring their skills.

More succinctly, the task is to produce the right person at the right time and at the right place.[1] In analyzing achievement of these objectives, we have accepted the classification of occupations, skill levels, associated training, etc., as "correct"; we address how well the system operates within these constraints.

In the remainder of this section we address three related topics:

- (1) the MPT system's ability to balance manpower authorizations and assignments in aggregate terms, (2) the identification of Air Force Specialties (AFSCs)[2] which experience consistent imbalance and an investigation of possible causes of the imbalance, and (3) the distribution of manpower resources among experience levels and geographic regions.

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[1] Interestingly, Grinold and Marshall (Manpower Planning Models, 1977, p. xix) state: "...a more realistic view...is that it avoids having too many of the wrong types of people in the wrong jobs too frequently."

[2] Air Force specialties are delineated in AFR 39-1. They are distinct occupational specialties, requiring common qualifications and, usually, airmen remain in a single specialty (designated by an alphanumeric code called an AFSC) throughout their service lives, while progressing through a series of skill levels.

### EVALUATION DATA

Our analysis here is primarily statistical. Findings are based on monthly records maintained by the USAF Military Personnel Center,[1] Randolph AFB, describing the levels of total AFSC authorizations and assignments from January 1974 through May 1977. These data are augmented by information regarding training times and experience distributions obtained from training manuals and the Uniform Airman Record; see Appendix A for details. In summary, the data are based on 199 four-digit AFSCs, representing about 75 percent of USAF enlisted force authorizations. (A weighting procedure, also described in Appendix A, was employed to make the sample approximately representative of all USAF enlisted force AFSCs.)

Except where noted, our discussions are based on six-month aggregations of the data. Thus, when we refer to an AFSC's authorization level during a particular six-month interval, we mean the average of the authorization levels in that period's individual months. This approach induces a mild smoothing effect and can obscure some short-term aberrations. We have employed monthly data where such aspects are problems, however, and have found virtually complete consistency between the two versions of the data. The six-month aggregations reduce the costs of data manipulation, of course, and minimize problems of missing data.

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[1] As already noted, the USAF Military Personnel Center, under the recent reorganization of manpower and personnel functions under the single DCS/MP, has been renamed the USAF Manpower and Personnel Center, retaining the designator AF/MPC.

(If data are missing for, say, one month in a semiannual period, the average employed for that period is taken over the remaining five months' data.) In addition, only larger and more persistent effects are manifest in the aggregated data. And for the most part, these broader behavioral patterns are the ones of current significant interest.

#### THE AGGREGATE BALANCE OF AUTHORIZATIONS AND ASSIGNMENTS

Because of the size, complexity, and dynamic nature of the enlisted manpower force, it is unreasonable to expect a perfect match between each AFSC's assignments and its authorizations. In investigating the closeness of the match between the two, we treat authorization levels as targets and consider the deviations of assignment levels from these targets. (Of course we recognize that authorizations change and are really "moving targets"; we consider that issue in Appendix D in a discussion of authorization projections.)

To establish the relative degree of imperfection in the overall match between assignments and authorizations, we consider first the average amounts of "over-assignment" (or overmanning) and "under-assignment" (or unfilled authorizations) in each semiannual period covered by our data. The results appear in Table 1 as percentages of average total authorizations. Referring to the table, note that in the July-December 1975 interval about 2.7 percent of the total USAF enlisted authorizations were unfilled. During that same period the number of enlisted people assigned in excess of authorized levels represented about 4.9 percent of total authorizations. Thus, the total force was 2.2

Table 1

PERCENTAGE DIFFERENCE BETWEEN ASSIGNMENTS AND AUTHORIZATIONS

For AFSCs with Overmanning and for AFSCs with  
Unfilled Authorizations

Item	Six-Month Interval						Jan-May 1977	Avg
	Jan-Jun 1974	Jul-Dec 1974	Jan-Jun 1975	Jul-Dec 1975	Jan-Jun 1976	Jul-Dec 1976		
Overmanning <sup>a</sup>	4.3	4.5	4.5	4.9	5.1	5.1	3.7	4.6
Undermanning <sup>b</sup>	1.8	1.4	1.3	2.7	1.1	1.4	2.0	1.7
Imbalance								
Total <sup>c</sup>	6.1	6.0	5.8	7.6	6.2	6.5	5.7	6.3
Net <sup>d</sup>	2.5	3.1	3.2	2.2	4.0	3.7	1.7	2.9

$$^a \text{Overmanning} = \frac{\text{total excess assignments in overmanned AFSCs}}{\text{total authorizations in all AFSCs}} \times 100$$

$$^b \text{Undermanning} = \frac{\text{total unfilled authorizations in undermanned AFSCs}}{\text{total authorizations in all AFSCs}} \times 100$$

$$^c \text{Total imbalance} = \text{overmanning} + \text{undermanning}.$$

$$^d \text{Net imbalance} = \text{overmanning} - \text{undermanning}.$$

percent overmanned during this period. The total of mismatches between authorizations and assignments (excesses plus shortages) was 7.6 percent of total authorizations.

Over the entire period, an average of about 1.7 percent of the authorizations were unfilled, approximately 4.6 percent of the assignments were in excess of individual AFSC authorizations, and the total mismatch between assignments and authorizations was about 6.3 percent of total authorizations. In total there were about 2.9 percent more assignments than authorizations.

More concretely, this means that in an enlisted force authorized at a level of approximately 450,000, about 21,000 people would be assigned to AFSCs in excess of those AFSCs' authorizations, and about 8,000 unfilled positions would exist in other AFSCs. This can be regarded as a fairly high overall level of subsystem performance--at least in aggregate--especially in view of the constant changes in manpower demand and supply and the constraints noted in the introduction. However, this level of aggregation can mask imbalances in authorizations and assignments at more detailed levels (regional distributions, skill levels, etc.). Ideally, our evaluation would proceed to an examination of each of these levels of detail. The available data, unfortunately, limit us to an evaluation of occupational imbalances and only qualitative comments concerning geographical and skill level authorization/assignment matching.

### Occupational Imbalances

Significant and persistent discrepancies between authorizations and assignments do exist for some individual occupational areas. That is, even though the aggregate figures indicate a relatively close match in "faces and spaces," examination of career area authorizations versus assignments indicates the occurrence of significant manpower imbalances. For example, during our forty-one-month data period, the occupation of "semi-rigid rotor helicopter mechanic" experienced eleven months in which there was at least a 20 percent manpower shortage (averaging about 90 unfilled authorizations) and twenty-one months in which there was at least a 10 percent manpower shortage (including one stretch of fifteen consecutive months). In the missile control communication systems maintenance occupation there was at least a 50 percent oversupply (averaging about 800 people) of personnel in six months during the data period and twenty-two consecutive months of at least a 10 percent oversupply of personnel.

We have elected to define "significant" occupational (AFSC) manpower imbalances as those in which authorizations are either greater than or less than assignments by 10 percent or more. The justification is two-fold: first (an operational reason), non-mobilization-designated units must be 90 percent manned (assignments equal to at least 90 percent of authorized manpower) as specified in the "Standard Aircraft Organization Manning Criteria" in order to be classified as operationally ready. Thus, a 10 percent or greater shortfall degrades readiness and signals an

imbalance problem to us. Second (a data-dependent reason), 10 percent imbalances are exhibited by a sizable yet not unreasonably large proportion of the sample. (Specifically, 22.1 percent of the monthly observations show assignment overages of at least 10 percent, and 11.5 percent show assignment shortages of at least 10 percent. See Appendix E for the distribution of excesses and shortages.) Table 2 displays the percentages of the sample AFSCs exhibiting significant imbalances during each of the data period's semiannual intervals. Roughly one-third of the AFSCs exhibited at least a 10 percent imbalance at any point in time, and only about one-third of these imbalances were due to manning shortages. Not incidentally, analysis of monthly versions of these data (see Appendix C) indicates that the percentage of AFSCs exhibiting significant shortages declined by about one-fourth during the period covered by the data.

Another way of viewing the AFSCs in significant imbalance situations at any time is by considering those that exhibit persistent imbalance behavior and those that experience only occasional imbalances. That is, beyond using 10 percent as a threshold for significant or critical imbalances, we seek a time-sensitive threshold which could indicate problems of persistent or "chronic" imbalance. To illustrate, not all of the 17 percent of the AFSCs exhibiting significant excess manning in the January-June 1975 period were included in the 23 percent exhibiting such excesses in the corresponding 1976 period. Table 3 displays the percentages of AFSCs exhibiting various combinations of authorization-assignment imbalance during the seven six-month

Table 2

PERCENTAGES OF AFSC'S EXHIBITING SIGNIFICANT  
AUTHORIZATION/ASSIGNMENT IMBALANCES

Imbalance Category <sup>a</sup>	Six-Month Interval							Avg
	Jan-Jun 1974	Jul-Dec 1974	Jan-Jun 1975	Jul-Dec 1975	Jan-Jun 1976	Jul-Dec 1976	Jan-May 1977	
Significantly overmanned	20	28	17	25	23	26	16	22
Approximately balanced	68	62	74	64	69	67	72	68
Significantly undermanned	13	10	9	11	8	7	12	10
Total with significant imbalance	33	28	26	36	32	33	28	32

<sup>a</sup>"Significant" imbalances occur when assignments differ from authorizations by more than 10%.



periods. For example, 27 percent of the AFSCs were not out of balance any of the seven semiannual periods, and only about 1 percent of the AFSCs experienced two periods of significant shortages and two periods of significant excesses. As indicated in the table, we designate chronically imbalanced (or simply "chronic") AFSCs as those experiencing significant (at least 10 percent) imbalances during at least half of the semiannual periods.[1] Chronically out-of-balance AFSCs are subdivided into chronic shortage, chronic excess, and chronic unstable categories depending, respectively, on whether they were predominantly in shortage situations, excess situations, or equally divided between both. We observe that only about 9 percent of the AFSCs experienced both significant shortages and significant excesses during the seven periods, of which only 2 percent are classified as chronically unstable.

This categorization permits us to examine the relative contributions of chronically imbalanced AFSCs to the total authorization/assignment imbalance. Table 4 displays relevant statistics. (Note: the totals in Table 4 have already been seen in Tables 1 and 2.) Observe that about half to three-quarters of the AFSCs exhibiting significant imbalances in any semiannual period were chronically imbalanced AFSCs; the average over the seven semiannual periods was about 66 percent (i.e., 21 percent out of 32 percent). Table 4 also reveals that about one-fourth

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[1] Of course, many other definitions of chronic imbalance are possible. This one is both simple and convenient.

Table 3  
PERCENTAGE OF AFSCs IN EXCESS AND SHORTAGE  
MANNING SITUATIONS - SEMI-ANNUAL PERIODS

Semi-Annual Periods in Shortage

	0	1	2	3	4	5	6	7
0	27	10	4	2	0	3	2	1
1	13	4		1				
2	6		1					
3	7			1				
4	6							
5	5	1						
6	5	1						
7	3							

Chronic Shortage (6.4%)

Chronic Unstable (2.0%)

Chronic Excess (18.7%)

NOTE: Entries in this table do not add to 100 due to rounding.  
A zero in the table indicates a positive percentage less than 0.5.

Table 4

CONTRIBUTIONS OF CHRONIC AND NONCHRONIC AFSC'S TO  
SEMIANNUAL IMBALANCE CATEGORIES

Type of AFSC	Six-Month Interval							Avg
	Jan-Jun 1974	Jul-Dec 1974	Jan-Jun 1975	Jul-Dec 1975	Jan-Jun 1976	Jul-Dec 1976	Jan-May 1977	
<i>% of AFSCs Experiencing Significant Imbalance</i>								
Chronic	17	21	19	23	23	24	18	21
Nonchronic	16	17	7	12	8	10	10	11
Total	33	38	26	36	31	33	28	32
<i>% of Authorizations Overmanned</i>								
Chronic	1.1	1.6	1.4	1.4	1.3	1.4	1.0	1.3
Nonchronic	3.2	3.0	3.1	3.5	3.8	3.7	2.7	3.3
Total	4.3	4.5	4.5	4.9	5.1	5.1	3.7	4.6
<i>% of Authorizations Undermanned</i>								
Chronic	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3
Nonchronic	1.6	1.2	1.0	2.4	0.8	1.1	1.7	1.4
Total	1.8	1.4	1.3	2.7	1.1	1.4	2.0	1.7

of the total imbalance in each six-month period was contained in AFSCs classified as chronic. Specifically, an average of nearly 30 percent (i.e., 1.3 percent out of 4.6 percent) of total overmanning was contained in chronic AFSCs and less than 20 percent (i.e., 0.3 percent out of 1.7 percent) of total undermanning was contained in chronic AFSCs. More succinctly, most of the total imbalance at any time was contained in the non-chronic AFSCs, but most of the AFSCs experiencing significant imbalances at any time were chronic AFSCs.

In summary, our analysis of the data reveals that between January 1974 and May 1977:

1. Total imbalances (assignment excesses plus shortages) amounted to about 6 percent of the total authorizations, about one-third of the AFSCs exhibited significant assignment/authorization imbalances at any point in time, and about two-thirds of these exhibited overmanning.
2. The undermanning imbalances declined (in terms of the percentage of occupations exhibiting undermanning) by about one-fourth over the three-and-one-half-year study period.
3. About one-fourth of the occupations experienced chronic problems of imbalance.
4. Most of the occupations experiencing significant imbalances at any time were chronically imbalanced occupations; and
5. Most of the total imbalance at any time was due to non-chronic AFSCs.

### Characteristics of AFSCs with Chronic Imbalances

Chronically imbalanced AFSCs constitute the major proportion of those exhibiting significant imbalances at any time, and their imbalance constitutes a substantial proportion of the total imbalance. As already noted, mission performance may be jeopardized by significant personnel shortages in individual work units. Chronically overmanned AFSCs, on the other hand, may contribute to serious underutilization of human resources in individual work units. Consequently, we have examined chronic AFSCs somewhat more closely in search of distinguishing characteristics. Recognition of such characteristics may provide insight into likely causes of chronic imbalance problems and also foster development of guidelines for identifying chronic imbalances.

The AFSCs which exhibited chronic imbalances in our sample are listed in Table 5 in decreasing order of imbalance frequency. Before presenting a more quantitative description of their characteristics, we note a few qualitative aspects about these forty-five AFSCs. First, the chronically overmanned category contains relatively more mission-critical AFSCs than does the chronically undermanned category (about two-thirds as opposed to one-third).[1] Second, electronics and aircraft/system maintenance specialists dominate the chronically overmanned category. And third, medical specialties contribute the largest number of

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[1] The mission-criticality of individual AFSCs was established subjectively on the basis of specialist titles. For example, weapon control systems mechanics are judged more important for combat purposes than clarinetists.

Table 5

LIST OF CHRONICALLY-IMBALANCED AFSCs

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Chronically Overmanned AFSCs

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Chronically Undermanned AFSCs

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Seven semi-annual periods of significant imbalance

*Radio Operator (293X3)	Preventive Dentistry (981X1)
*O/I Maintenance (363X0)	Allergy/Immunology (912X4)
Meatcutting (612X0)	
Morale, Welfare and Recreation (741X0)	
Education (751X0)	
*Integrated Avionics Systems (326X2C: Communications, Navigation, and ECM Systems)	

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Six semi-annual periods of significant imbalance

*Auto Tracking Radar (303X3)	Cardiopulmonary Laboratory (916X0)
*Missile Electronic Equipment (316X26)	*Electronic War Countermeasures (276X1)
	Navigation/Bombing/Tactics Trainer (343X0)
Photolithography (713X1)	
Recreation Services (741X1)	
*Missile Systems Maintenance (316X1F and 316X1L)	
*Linguist (3 periods of excess, 3 of shortages)	

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Five semi-annual periods of significant imbalance

*Radio Relay Equipment (304X0)	*Avionic Communications (328X0A)
*Flight Facilities Equipment (304X1)	Budget (672X0)
*Electronic Communications and Cryptographic Equipment (306X0)	Instrumentalist (817X0A: Clarinet)
*Avionic Communication (328X0)	
*Airborne Early Warning Radar (328X2)	
Reciprocating Engine (426X1)	
*Machine Shop (531X0)	
Printing-Binding (713X0)	

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Table 5

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Four semi-annual periods of significant imbalance

Telephone Equipment	Security Police (812XDA)
Installer (362X4)	*Missile Facilities (541XOG)
*Air Operations (271X0)	
*Telecommunications Systems	
Control (307X0)	
*Automatic Flight Control Systems	
(325X0)	
*Integrated Avionics Systems (326X2A:	
Inertial Bomb Nav.)	
*Integrated Avionics Systems (326X2B:	
Flight Control and Data	
Recorders, etc.)	
*Helicopter (431XOC: Articulated Rotor)	
*Helicopter (Semi-rigid Rotor)	
(431XOD: Semi-rigid Rotor)	
Aircraft Maintenance (431X1A: Recip.	
Engine Aircraft)	
Air Passenger (605X0)	
Information (791X0: Journalist)	
*Sheet Metal Worker (531X2)	
*Precision Measurement	(2 periods of excess,
Equipment Lab. (324X0)	
*Avionics Sensor Systems (329XOB: 2 of shortage)	
Electro Optical)	

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\*Indicates AFSC subjectively judged to be relatively "mission-critical."

imbalance observations to the chronic shortage category.

In a brief quantitative examination of AFSCs exhibiting chronic and non-chronic imbalances, we observed the following characteristics:

1. Smaller AFSCs, probably because of their size, are more influenced by the randomness of airman retention behavior, and hence, have more potential for imbalances.
2. High rates of turnover (the percentage of the specialty represented by first-term airmen serves as a proxy for turn-over rate) did not tend to explain chronic imbalances, contrary to our preliminary expectations.
3. AFSCs with longer training times (supposedly making it more difficult to respond to authorization changes) did not tend to be chronically imbalanced.
4. Chronically imbalanced AFSCs did experience relatively more authorization fluctuations than others. For example, the variation in authorizations for chronic shortage AFSCs was about 50 percent greater than for non-chronic AFSCs.

Discussions supporting these and related observations are presented in Appendix D.

#### THE DISTRIBUTION OF MANPOWER RESOURCES

The preceding analysis focuses on the agreement between total authorizations and assignments for an occupation. In practice, manpower in an occupation is further subdivided by (at least) location, skill level, and grade. Allowing only two grades per skill level (the skill levels are 1, 3, 5, 7, and 9) and supposing a particular AFSC is employed at, say, 150 installations, the specialty can be subdivided immediately into 1,350 distinct categories.[1] If personnel in a specialty are employed

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[1] During some periods, up to three different pay grades have been permitted per skill level.



in different work centers (as, for example, are administrative specialists, AFSC 702X0) and different major commands, these constitute further characteristics which subdivide the specialty's authorizations and assignments. For many specialties, the number of possible combinations of location, grade, skill level, work center, and major command actually exceeds the total number of people in the specialty. The point here is that it is not sufficient to ascertain that, in general, total assignments to AFSCs coincide fairly closely with their authorizations. The manpower, personnel, and training system must not only provide the proper numbers of specialists at the proper times, which is what we have examined to this point, but these people need also to "appear" in the desired places and to bring with them specified combinations of experience and training.

It is common to hear USAF personnel say that, "We have too many skill level 3 people and not enough skill level 5 people." Unfortunately, our data regarding historical agreement between authorizations and assignments contain no indication of these more detailed distributional characteristics and hence do not allow us to examine authorization/assignment agreement at these more refined levels. However, the Air Force has recently undertaken a comprehensive study of enlisted grade and skill imbalances by occupation in order to address important questions regarding the distribution of its human resources.

The Air Force study eventually should facilitate assessment of such issues as distribution equity and productive capability. In addition, if authorizations (as budgeted manpower constraints)

are compared with the detailed manpower "requirements" (the unconstrained personnel needs) represented in manpower standards, a coherent picture of the realism and impact of these standards should emerge. Of course it is important not only to understand how manpower "users" would employ people in combinations which might differ from standard manpower configurations (the preferred combinations being reflected in manpower authorizations influenced by budget limitations), but how close the supply side of the manpower, personnel, and training system comes to providing these combinations. Thus, it should be possible to compare three forms of the distribution of trained manpower: (1) recommended unit manning, based on manpower standards and guides, (2) authorized unit manning, based on subsequent funding and detailed manpower allocation decisions, and (3) actual unit manning based on individual assignments.

To evaluate the performance of the authorization/assignment subsystem at these more detailed levels, we recommend that statistical analyses similar to those represented here be accomplished. Specifically, historical records of work center authorization, standard manning, and assignment detail should be assembled. Criteria for defining "significant" and "chronic" imbalances should be established for evaluations at different levels of detail (e.g., command, pay grade, and/or unit). Analyses of these data with respect to such criteria should clarify, for example, whether some segments of the Air Force fare worse than others in obtaining qualified personnel, whether some may "game the system" by inflating or upgrading authorizations in order to

receive the people they desire, and whether some may be losing mission capability because of inadequate or inappropriate manning.

Qualitative knowledge that standards, authorizations, and assignments do not and, practically speaking, cannot match perfectly leads to the conclusion that, fairly often, units either (1) satisfy their required missions (quantitatively and qualitatively) with manning configurations other than those delineated in manpower standards or (2) provide capabilities different from those required (whether higher or lower). This leads us to consider the specification of manpower required to accommodate the workloads experienced by individual units. In particular, our attention begins to focus on detailed manpower standards since they constitute the initial element in the sequence leading from "requirements" to "authorizations" to "assignments." The question is fundamentally whether the standards, representing the primary basis for authorizations, represent the "best" targets for unit manning.

Air Force manpower standards specify the manning to accommodate workloads in individual base work centers. As described earlier, standards play a fundamental role in influencing the distribution of manpower resources. They do so more in a long-run mode, however, than do frequent authorization allocation and personnel assignment decisions. The standards development process together with the other longer term efforts of establishing and refining personnel plans, objectives, and policies form the manpower requirements/personnel objectives subsystem of the

overall manpower, personnel, and training system. This longer-term planning subsystem is the subject of the remaining sections of this Note.

#### SUMMARY

The statistical analysis of the authorization and assignment information at the level of total AFSCs, between January 1974 and May 1977, reveals the following:

1. Total imbalances (occupational assignment excesses plus shortages) amounted to about six percent of total authorizations; the overall net imbalance was less than three percent.
2. About one-third of the occupations exhibited significant (greater than 10 percent) authorization/assignment imbalances at any time.
  - a. About two-thirds of these occupations exhibited overmanning.
  - b. The percentage of occupations experiencing significant shortages diminished by about one-fourth over the three-and-one-half-year study period.
3. About one-fourth of the occupations exhibited chronic imbalances (10 percent imbalances at least half of the time).
4. Most of the occupations experiencing significant imbalances at any time were chronically imbalanced, but most of the total imbalance at any time was due to non-chronic AFSCs.
5. Characteristics of chronically imbalanced AFSCs include
  - a. smaller size,
  - b. larger growth trends (increasing or shrinking),
  - c. longer training times and higher "mission criticality" for chronically overmanned AFSCs, and
  - d. more authorization instability (variation in size around trends).

The authorization/assignment subsystem apparently succeeds rather well in subdividing authorized manpower levels among specialties and meeting these distributed manpower requirements with assigned personnel in the same specialties. Of course this

does not rule out distribution or assignment problems at the more detailed levels of individual commands, bases, skill levels, or pay grades.

### III. MANPOWER REQUIREMENTS/PERSONNEL OBJECTIVES SUBSYSTEM

#### OVERVIEW

Similar to Figure 3 which represents the authorization/assignment subsystem, Figure 4 is a flow diagram depicting the manpower requirements/personnel objectives subsystem. This is a planning subsystem which establishes manpower requirements (e.g., requirements based on engineered manpower standards) and develops long-run personnel plans and policies (e.g., target or "objective" distributions of personnel among specialties, grades, and experience levels).

In the discussion that follows, we will observe the dependence of the manpower requirements/personnel objectives subsystem on historical data. These data are extracted from manpower and personnel files maintained within the authorization/assignment subsystem and from operating units whose manning is effected by the authorization/assignment subsystem. Hence, Figure 4 depicts three major inputs to the planning subsystem from the programming subsystem: historical data regarding unit operations, authorizations, and personnel behavior.

In discussing the manpower requirements/personnel objectives subsystem, it is convenient to examine the processes which generate the two types of information it provides to the authorization/assignment subsystem (recall Figure 3): manning guidelines and overall personnel objectives.

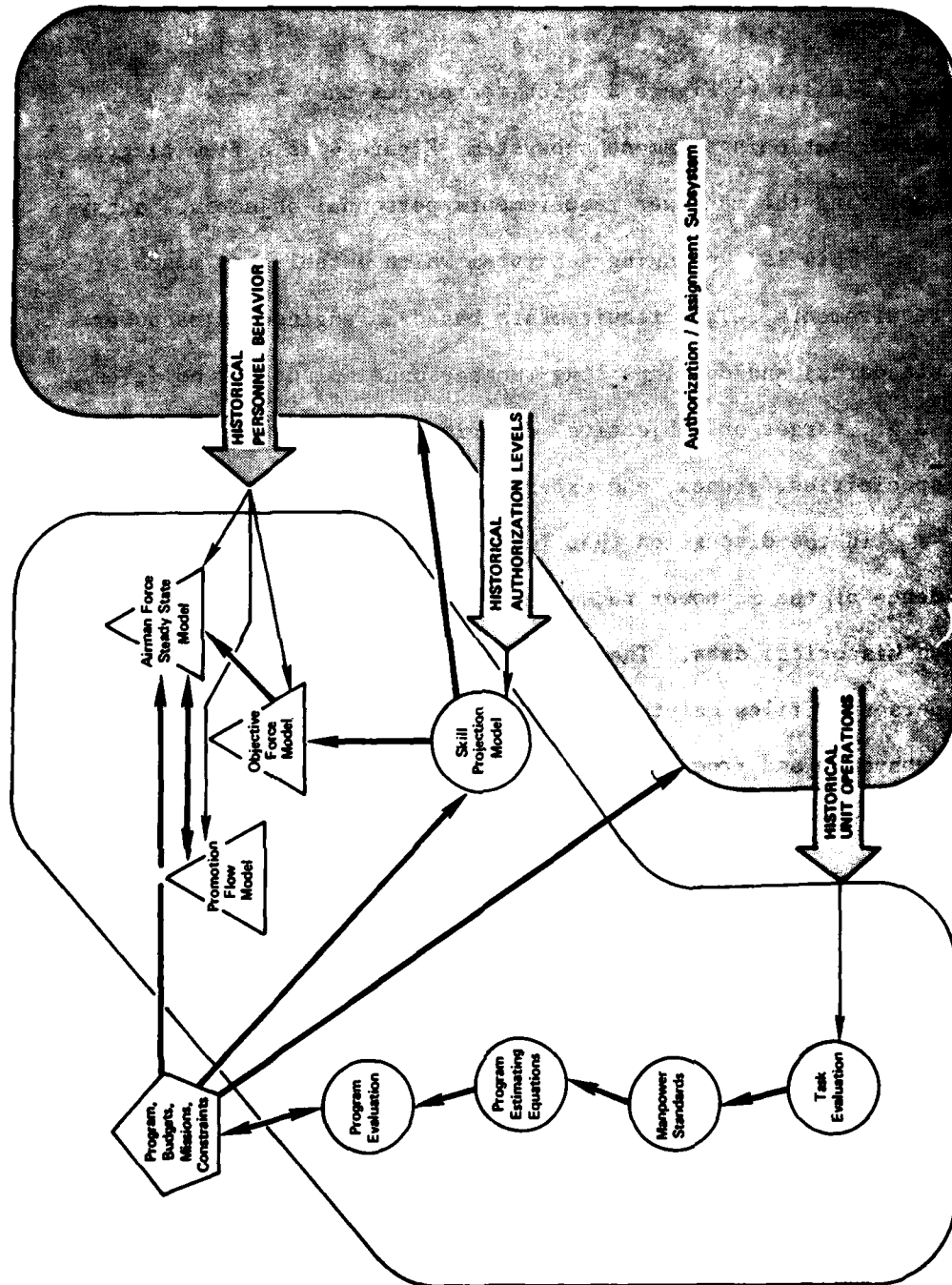


Fig. 4 — The manpower requirements / personnel objectives subsystem

### MANNING GUIDELINES

As indicated in Figure 2, detailed manpower requirements are determined by using (1) workload projections based on program plans (e.g., flying programs), (2) program estimating equations (general guidelines indicating the requirements for broad groups of personnel associated with program operations), and (3) detailed manpower standards based on unit organization structure and analysis of work unit tasks. Manpower standards are at the heart of this matter; they are also the basis for program estimating equations. An example standard is excerpted in Figure 5, a copy of part of Air Force Form 1113 from the manpower standard for a work center called Personnel Records.[1] (This work center, found at nearly every Air Force installation, is responsible for controlling access to and maintaining personnel files/folders.)

The fundamental manpower equation for this work center (estimated using regression analysis of data from 29 bases in this case)--i.e., the equation used to convert projected workload to the number of manhours required per month to accommodate that workload--is as follows:

$$Y = 40.74 + .3253X(1) + .1519X(2)$$

where X(1) and X(2) are, respectively, the numbers of officer and enlisted personnel assigned to the base, and Y is the number of

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[1] See Final Report, USAF Engineered Manpower Standards: Chief, Personnel Division and BPO, FC 16XX, Air Force Personnel Management Engineering Team, 21 September 1976, pp.2-273 to 2-299.



STANDARD MANPOWER TABLE		WORK CENTER TITLE/CODE Records/1652						
AIR FORCE SPECIALTY TITLE (AFS)	AFSC	Manhour aval	FRACTIONAL MANPOWER CUTOFFS					
		242	13.156	14.168*				
		183	13.520	14.560	15.600	16.640	17.680	18.450*
		180	13.559	14.602	15.645	16.688	17.731	18.760*
		144	13.999	14.999	15.999	16.999	17.999	18.999
		GRADE		MANPOWER REQUIREMENT				
Personnel Superintendent	73294	SMS	1	1	1	1	1	1
Personnel Technician	73270	MSG	1	1	1	1	1	1
Personnel Technician	73270	TSG	1	1	1	1	1	1
Personnel Technician	73270	SSG	1	1	1	1	1	1
Personnel Specialist	73250	SSG	1	1	1	1	1	1
Personnel Specialist	73250	SGT	3	3	4	4	5	5
Personnel Specialist	73250	AIC	2	3	3	3	3	3
Apr Personnel Specialist	73230	AIC	4	4	4	5	5	6
TOTALS			13	14	15	16	17	18

SOURCE: Final Report, USAF Engineered Manpower Standards, Chief Personnel Division and CBPO, FC 16XX, 21 September 1976, p. 290.

Fig. 5 — An example standard manning table

manhours required per month to operate the Personnel Records work center. Thus, if a particular base's assigned manpower were projected to change from 2,500 officers and 12,000 enlisted personnel to 2,000 officers and 9,000 enlisted personnel, the number of monthly manhours recommended to handle personnel records would decrease from 2,677 to 2,058. Using the latest peacetime "availability factor" of 145.2 work-available manhours per individual per month, these figures translate to 18 and 14 individuals, respectively, required to operate the work center. As revealed in Figure 5, these quantities can be converted to detailed manpower requirements in terms of occupational specialty and skill level (represented together in the AFSC) and grade. In this hypothetical case the projected base assignment reduction from 14,500 to 11,000 results in decrementing the base's Personnel Records manpower requirement by 4 people: 2 journeymen at the grade of Sergeant (E-4) and 2 apprentices at the grade of Airman First Class (E-3).

Standards currently cover approximately 65 percent of Air Force manning. Coverage is being expanded continually with older standards being reviewed and revised as activities, work methods, and/or technologies change. Considerable Air Force attention is being directed toward shortening the time required to construct a standard (targeted at 15 to 16 months from initiation to completion) and toward improving the specification of skill levels and grades.

To complement engineered standards, the Air Force employs a computerized model (LCOM, the Logistics Composite Model) to simulate activities in several maintenance-related work centers. The model requires detailed specification of maintenance workload generation (e.g., using flying program scenarios and expected failure rates), handling (e.g., designating which malfunctions are repaired and in what proportion at each possible location), and support levels (e.g., describing repair and resupply times). Iteratively, it evaluates overall system performance measures (e.g., aircraft sortie rates, delays and down-times due to maintenance and supply, technician utilization rates, and inventory fill rates) and adjusts the associated levels of support resources (in particular, the numbers of different types of maintenance technicians, ground support equipment units, and inventory stockage quantities) until desired performance levels are achieved. At this level of detail, model inputs are so difficult to develop and the model itself is so expensive to operate that LCOM is used only to develop total manpower requirements within occupations under an operating program. Breakdowns of total manpower into skill levels and grades are not considered in the model.

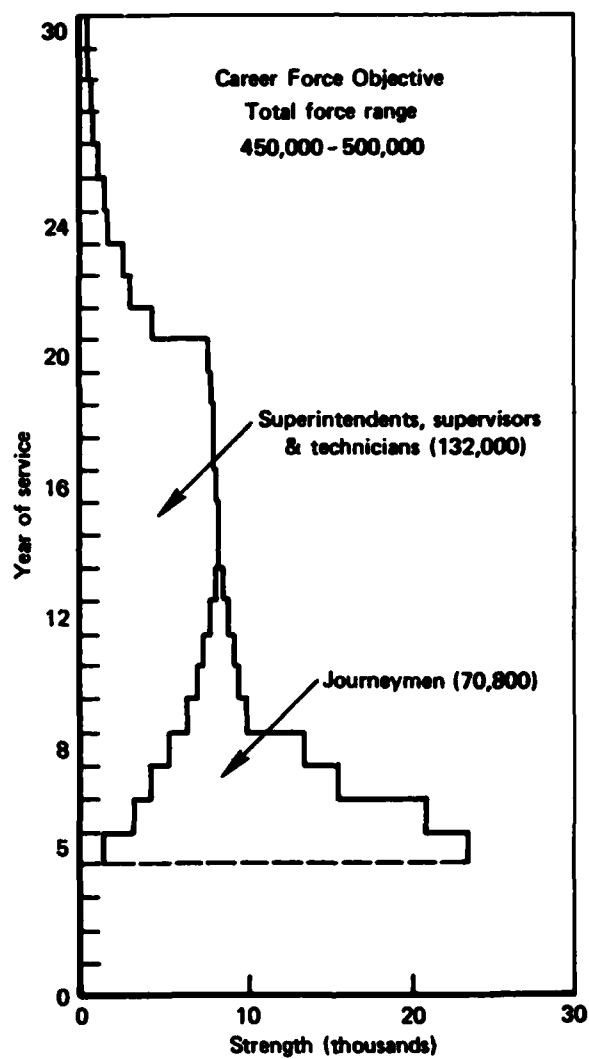
In addition to their fundamental role in the determination of detailed manpower requirements, standards usually constitute the basis for "Program Estimating Equations (PEEs)"--as depicted in Figure 4. These equations, which typically consider both manpower and workload in a more aggregate manner than the standards, permit simplified computation of varying total manpower require-

ments corresponding to alternative force program plans. Key requirements of PEEs are that they permit quick computation of aggregate manpower requirements and that they accept relatively few programmable factors as independent variables. For example, a PEE for the Aerospace Ground Equipment work center might yield manpower requirements as a function of flying hours and sorties while the standard itself determines requirements on the basis of the quantities of numerous types of equipment maintained. The PEE is much simpler to use, and approximate manpower requirements can be determined quickly on the basis of time-sensitive, programmed data. These short-term characteristics are imperative in evaluating and assessing alternative force programs that are considered during manpower standard application process.

#### OVERALL PERSONNEL OBJECTIVES

Enlisted personnel objectives take the form of a target force structure and promotion/reenlistment/accesion policies which will lead to eventual achievement of that target. These objectives are referred to as TOPCAP, the Total Objective Plan for Career Airman Personnel; they are developed using a system of computerized mathematical models.

Figure 6 depicts a representative target force structure-- for career personnel only (those beyond their first term of enlistment). This sort of objective structure is determined by exercising the Objective Force Model for each of over 100 career progression groups (CPGs, collections of occupational specialties "which have common characteristics in terms of career progression and utilization") and then aggregating to the totals shown. This



SOURCE: USAF Personnel Plan, Vol. III Annexes (C1),  
10 September 1976, p. C-5.

Fig. 6 — Example objective career force structure

model accepts as inputs the numbers of skill level 7 (supervisor/technician) and skill level 9 (superintendent) personnel required in each CPG (as determined using the Skill Projection Model[1] and historically-based estimates of loss and upgrade rates (i.e., respectively, the proportions of enlistees who leave the Air Force each year and advance to higher skill levels each year). These inputs define a system of simultaneous linear equations which the model solves to determine the number of skill level 5 (journeyman) personnel needed in the career force to sustain or "feed" the higher skill levels. In so doing, the model ignores the Skill Projection Model's specifications for required manpower at skill levels 1, 3, and 5.

The career objective force structure is further refined into an objective grade structure and extended to include first term personnel using the Airman Force Steady State Model. This model also has an internal structure which solves simultaneous linear equations. Its purpose is to determine promotion policies to be applied for the enlisted force as a whole, rather than for individual specialty groups. Its primary fixed inputs are the size of the objective career force, total force size or end-strength, loss rate for each possible combination of grade level and year

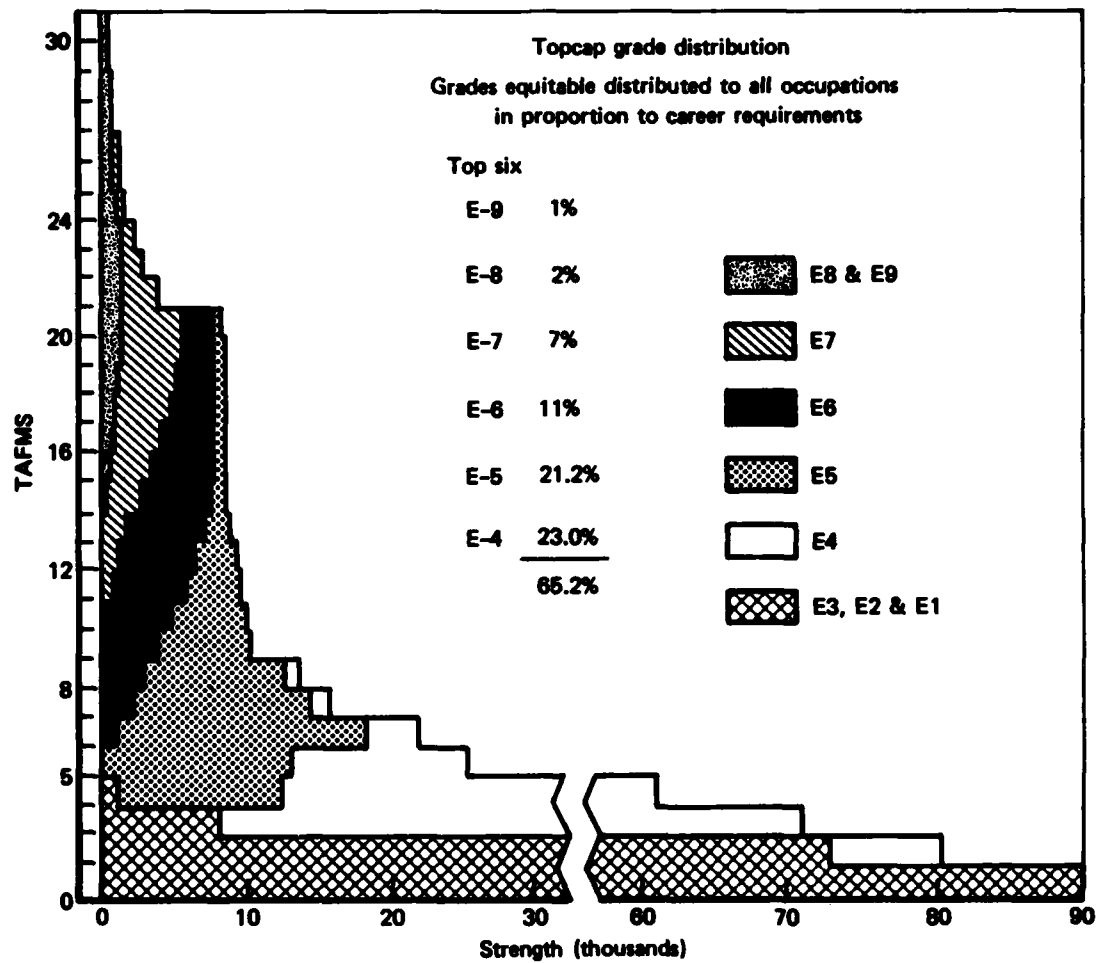
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[1] The Skill Projection Model is a computer program which forecasts distributions of authorized strengths for planned operations (represented in the Five-Year Defense Plan) in accordance with past patterns (indeed proportionately). These forecasts are treated as manpower requirements for purposes of personnel planning and programming, and so we have included the Skill Projection Model as part of the manpower-requirements/personnel objectives subsystem and as part of the authorization/assignment subsystem.

of service, and a promotion opportunity for each grade (i.e., the proportion of enlistees with a specified number of years of service who will have achieved that grade). Promotion phase points (the average number of years of service in each enlisted grade before promotion to the next higher grade) and then reenlistment rates and accessions are varied iteratively until desired numbers of personnel in each grade are attained which also sum to the required career force and total force sizes. The principal result is an enlisted force profile such as depicted in Figure 7. Implicit in this profile is a promotion structure consisting of the number of personnel in each combination of grade and years of service who should be promoted to the next higher grade.

Both the Objective Force Model and the Airman Force Steady State Model are "static" models; i.e., they derive force structures which are invariant from year to year. They take no account of presently or likely available manpower resources. Invoking the promotion policies so determined, however, should "drive" the current actual force structure, regardless of its form, toward the stationary or static structure--provided historical loss and upgrade rates persist.

Anomalies which may occur during the transition from the current structure to the static objective structure are identified using the Promotion Flow Model. This "dynamic" model, simplistically described, consists of a mechanism for sequential matrix multiplication. Starting with the current structure, each year's force (partitioned according to grade and year of service) undergoes attrition, aging, and promotion, consecutively, and



SOURCE: USAF Personnel Plan, Vol. III Annexes, 12 Sept. 1975, p. D-10.

Fig. 7 — Example objective grade structure



then required accessions are added to obtain the next year's expected force. The attrition and promotion steps are accomplished by multiplying the appropriate force structure matrices by matrices of loss rates and promotion rates, respectively. (The promotion rate matrix is that determined by the Airman Force Steady State Model.) "Unreasonable" projections such as years with extremely high accession requirements or cohorts with unusual promotion phase points are noted and referred to personnel policy planners. Possible results include policy revisions and subsequent re-exercising of the static and dynamic models. Model outputs include force structures similar to that illustrated in Figure 7, but specific to particular years within a selected planning horizon.

At this point, overall personnel objectives are essentially determined. A number of other special purpose models transform this overall objective force structure and promotion policy into objectives and guidelines for individual career progression groups, primarily on the basis of historical loss rates peculiar to personnel in those occupations. These CPG-specific objectives eventually constitute inputs to the Airman Skill Force Model within the authorization/assignment subsystem. This model compares current and projected manpower supplies against anticipated manpower requirements and plays a key role in determining the needs for personnel recruitment, training, and cross-training.

### OPERATIONAL CONCERNS

The USAF approaches to manpower requirements determination and development of personnel plans have received numerous accolades from the defense and governmental communities. Taken together, they represent a comprehensive, systematic, and sophisticated set of human resources management methods. The Air Force has developed these capabilities over many years, continually updating and improving them. The Management Engineering Program, with its formal organization, explicit data collection and analysis techniques, and manpower standards, plays an extremely vital role. The plethora of data regarding unit operations, manpower distribution, and individuals' career behavior--much of which data are maintained in automated files--constitutes a valuable resource. And substantial expertise has been exhibited in creating and using the numerous force planning models.

We point out these features and overall positive assessment of the subsystem to establish a proper perspective, for the remainder of our comments tend to take the form of criticism. We want to emphasize that only the inherent logic and formality of this subsystem make it possible to perceive the problems we address in the remainder of this section. And only the existence of present Air Force organizations and technical capabilities makes the alternative operational strategies we propose in the next section seem feasible.

Our discussion of operational concerns begins with some rather general comments regarding the overall integration of the manpower requirements/personnel objectives subsystem. These are

followed by subsections which address more specific aspects of the subsystem: unit manning specification and force structure planning.

#### Subsystem Integration

Many activities and products of the manpower requirements/personnel objectives subsystem depend on interaction between components of the subsystem. For example, force structures depend on manpower requirements--and vice versa. But the flow of information among subsystem components is often only partial. To illustrate, personnel planners determine promotion phase points and long-term accession and reenlistment objectives without regard to projected requirements for specialists at the three lowest skill levels. (Recall, for instance, that the Objective Force Model accepts manpower requirements at only skill levels 7 and 9.) And, another illustration, manpower requirements within a specialty, in the form of detailed standards or guides, are constructed with insufficient regard to temporary personnel factors such as possible widespread personnel shortages in a particular type of work center or transient variations in the availability of individuals with different levels of experience (e.g., the "humps" typically associated with periods of war).[1]

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[1] The term "hump" in this context refers to the relatively large numbers of people in cohorts entering service during build-ups and/or wartime periods. These cohorts historically have remained larger throughout their service careers and hence constituted a passing abundance of people with the same (but increasing) level of experience.

Consider also that training program changes can have some unexpected effects. For example, reducing course length for a technical specialty, say in an effort to reduce average training costs, may increase on-the-job training requirements, thereby reducing unit effectiveness. Eventually this may be manifested in increased manpower requirements for the work centers,[1] larger numbers of personnel being needed in the specialty, and hence more people being recruited and trained--possibly resulting in a growth of total training costs.

Our objective in these examples is to note that this subsystem is missing some important links; further, existing links seem to have inadequate influence in determining policies within the participating organizations. In the remainder of this section we note three elements of the manpower, personnel, and training system which provide natural foci for system integration, but which do not seem to be addressed effectively: manpower costs, specialty definition/classification, and certain personnel policies.

Quite naturally, the emphasis of many military planners is on mission performance, for the consequences of mission failure in wartime can be calamitous. But such a focus on performance can be accompanied by inattention to costs. We note that the Air Force's manpower requirements/personnel objectives subsystem cannot be indicted on this count, however. Costs are considered in the continuing program evaluation process, during force planning,

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[1] Productivity reductions may also be manifest in increased overtime, poor sortie performance, and a variety of other input/output measures.

and within the process of applying manpower standards. The debatable issue is the effectiveness of this cost consciousness. Virtually all Air Force members are familiar with manpower cost control actions taken by high-level decisionmakers. These often take the form of across-the-board personnel reductions and/or program cuts. That such moves reduce costs cannot be argued (although the effects on mission performance capability generally can be and are--and at some length and volume). But, as we discuss below in considering the specification of manning configurations and the development of force structure plans, more subtle adjustments that can be made in response to cost concerns are largely overlooked. We believe that consistent and effective attention to costs can improve integration and interaction in the manpower requirements/personnel objectives subsystem. Our suggestions for alternative operational strategies and our recommendations for relevant research and development activities will clarify how we believe that improvement can be realized.

As has been seen throughout our discussion, most enlisted manpower, personnel, and training system activities depend on the definitions of technical specialties. Manpower standards, promotion quotas, training programs, etc., are based on fundamental specifications regarding individuals' skills, aptitudes, and levels of experience. Current specialty classifications for enlisted personnel are published in Air Force Regulation 39-1. Appendix E excerpts the portion of that publication devoted to the definition/revision of the classification scheme. These instructions, emphasizing mission effectiveness, unit operations,

manpower requirements, personnel considerations, training, and costs, make it clear that the role played by the classification structure is fundamental to the entire manpower, personnel, and training system. Yet revision of the classification definitions seems relatively haphazard. Basically, changes are investigated when someone notices and points out a classification problem. While the Manpower Personnel Center regularly reviews the classification for each AFSC, there is no regular effort made to examine the overall classification structure for possible changes which might improve effectiveness and/or reduce overall costs.

Consideration of the combined implications for manpower, personnel, and training also should occur during evaluation of certain personnel policies. An example is the policy of advancing enlisted personnel into the ranks of management as non-commissioned officers as opposed to retaining some as senior technicians. That is, typically, once a specialist attains a certain level of experience and technical competence, his only options are to be promoted to a supervisory position or to leave the Air Force. Essentially, the subject here is similar to the "up-or-out" issue so often discussed for officer personnel. One policy option is to allow some airmen to progress into higher enlisted grades and continue working as technical specialists rather than supervisors; thus, the issue here is really a matter of personnel utilization. The ramifications for unit manning, retention, force structures, recruiting, training, costs, and mission capability are important; but a ready means for considering these combined effects is not available. Similarly, mechan-

isms for evaluating policy revisions in the retirement and compensation programs--especially as they might affect retention rates, and hence workforce structure, costs, and productive capability--do not exist. Integrated means for evaluating effects of enlisted force entry requirements (e.g., mental aptitudes) are also lacking--as are methods for considering options related to changes in manpower supply (e.g., trying to achieve force structures with larger numbers of more senior personnel, who in many occupations must be more productive than their juniors, during times of diminishing availabilities of enlistment-eligible youth).

The research we discuss in the final section of this paper should consider many of these integrative planning issues. Specifically, improved means for addressing these problems can come through enhanced methods for developing manpower requirements and personnel force plans. The following two subsections focus on problems specific to these two components of the current manpower requirements/personnel objectives subsystem.

#### Unit Manning Specification

As already mentioned, recommended manning for individual work units is specified in manpower standards and guides. Thus, although commanders have the discretionary authority to distribute their allotted authorizations differently, these common guidelines represent the "default" work center manpower configurations. As exemplified in Figure 5, these manpower standards specify, for any given workload, the total quantity of manpower needed to operate the work center and the "quality" breakdown of

this total into quantities for specific specialties, skill levels, and grades.

Such standards are constructed painstakingly, with special care taken to involve the affected organizations, and with considerable opportunity for review and revision. When they are eventually employed, they often result in manpower cost reductions far in excess of the cost of their development.[1] They also sometimes result in manpower authorization increases. The standards have the additional effects of encouraging similar operations among similar work units in different locations and of maintaining a common "standard of living." As time and authority allow, efforts are also made during standard development to review work methods, procedures, organization structure, etc. and to introduce improvements which make the work centers more efficient and/or effective.

The most apparent feature of standards is their singularity. That is, for a given workload there is recommended just one manpower configuration: a fixed number of people with each combination of specialty, skill level, and pay grade, adding to a single total. For example, there is no indication that the work handled by the 15 people recommended in the third column of Figure 5 could also be handled by, say, 13 people if, for example, there were fewer low-skilled workers and a few more high-skilled workers. A hypothetical alternative configuration might involve substituting 1 supervisor/technician and 1 senior journeyman for 2

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[1] See Chapter 21, AFR-25-5, November 1977.



junior journeymen and 2 apprentices. Of course such a substitution would not imply the straightforward takeover of the junior peoples' work by the more highly skilled and experienced people. A number of more subtle shifts of tasks among these and other individuals would be required to maintain satisfactory relationships between the types of people involved and the kinds of work they perform. (Note: this example is hypothetical only; we are not implying that this particular unit manning change is desirable or even feasible).

Consider one eventual effect of developing the singular standards we see today: limited flexibility in force planning. As a simple illustration, consider a hypothetical work center found at say, 100 bases, each base experiencing a different workload for that work center. Suppose eight types (or "categories") of people, distinguished by skill level and grade within the same specialty, are employed in these work centers. For each workload a manpower standard specifies the recommended number of each category to employ. By summing these numbers over all bases, we obtain the forcewide total requirement for specialists in each category. Thus, basically, we have identified a single total force structure for this specialty. Our continuing goal then becomes attainment of this targeted force structure. If, on the other hand, multiple force structures were identified--i.e., alternative workforce structures capable of performing the same missions--substantial flexibility could be introduced into the force planning process. Attention could then be directed toward evaluating the costs of attaining these alternative workforce

structures--including expenditures for basic pay and allowances, of course, in addition to costs for recruiting, initial training, retraining, bonuses, retirement pay, and, perhaps in the future, separation pay. These costs change over time as personnel policies change, and policy changes are often reactions to changes in the "external environment"--e.g., demographics or civilian employment opportunities. By maintaining pursuit of a single workforce structure, the current planning process forgoes potential opportunities to achieve savings in many high-cost areas of workforce development and support. And to the extent that the single targeted workforce structure is not achieved, the mission capability of the evolving workforce may differ from the desired capability.

Other concerns regarding the specification of single unit manning configurations emerge as we look backward beyond the standards and into the processes which generate them. Several of these concerns have been intimated in the previous discussion.

One observation is that standards tend to be generated in a circular manner, tending to perpetuate past manning practices. During the standard "measurement phase," data from about 15 to 30 sample bases are collected. These data represent current operations; for instance, they might reflect the "measured manhours" expended in the conduct of each of several work categories and/or in each of several hundred individual work center activities. Typically, such data are aggregated into total manhour figures; identities of the types of individuals who contribute these manhours are not maintained. The total manhour quantities become

observed values for the dependent variable in functional (regression) relationships with one or more independent variables (or "workload factors"). Alternative functional relationships among the variables are routinely examined to find an equation providing the best possible explanation of current total manhour expenditures. This becomes "the standard equation" for the subject work center.[1] The key point is that the manpower standard reflects current work center practices. Insufficient attention seems to be paid to data which indicate exceptionally efficient performance (i.e., the "maverick" or "outlier" bases whose manhour expenditures seem relatively lower in comparison to workload). The thrust is to "normalize" into a common or average sort of relationship, possibly even standardizing on mediocrity.

We should emphasize an interesting process of data aggregation and disaggregation in standards development. Basically, data regarding the detailed distribution of effort among tasks is aggregated into total manhour expenditures and employed in estimating the standard equation. Then, essentially using MET personnel's best judgments, each possible total number of people that might be employed in the work center is disaggregated into constituent numbers of people according to specialty, skill level, and grade. Detailed data regarding the quantities of dif-

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[1] Of course a considerable amount of work goes into analysis of the elemental data to identify possible inconsistencies, errors, necessary adjustments, etc. and to determine "additives" and/or "subtractives"--i.e., justifiable deviations from the standard due, for example, to base or command-peculiar operational characteristics.

ferent types of work to be performed are relatively little used. Strong influences in establishing these breakdowns belong to past manning practice (as reflected in authorizations) and to grade guidelines (developed in planning long-term force structures which are also based on historical patterns; see next section). A related observation is that the basic standards "measurement" data are not person-specific. For example, in work sampling studies, the percentage of time spent in each category of work is estimated by observing different types of workers; novices and experts are not differentiated. In fact, when people are observed to work at different rates, their rates are "leveled" or normalized using "pace rating." [1] This approach protects the identities of the individuals observed in the study and hence promotes their cooperation, but it also masks the "quality" associated with the time expended in each activity. As a further example, the operational audit technique results in estimates of the times required to perform individual tasks, but no information is available on how these times might vary among the different types of people (e.g., with different specialties and/or skill levels). This sort of data would seem to be critical in specifying unit manpower configurations capable of meeting overall performance requirements.

Standard manning configurations are also constructed with little regard for likely manpower availability. Only subjectively can management engineers weigh the merits of manpower

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[1] See Attachment 7, AFR 25-5, November 1977.

configurations which differ, for example, in their dependence on first-term airmen. Of course there is widespread military concern over potential shortfalls of and/or increased expenditures for first-term personnel (due to declines in the numbers of youth eligible for military service), but there is no formal mechanism for considering these possibilities in specifying manning configurations. A further concern relating to insensitivity to manpower availability: there is limited capability for adapting to known shortages or excesses of specialists with particular levels of experience. That is, existing "humps" and "valleys" in individual specialties' force profiles, perhaps due to periods of wartime, reduced operations, personnel dissatisfaction and exodus, etc., are not considered. Correcting these deviations through cross-training, bonus plans, reductions in force, etc. can be difficult and expensive.

We find also that the standards development process embodies insufficient opportunity to consider cost implications. As already noted, costs for training, retraining, recruitment, reenlistment, separation, and retirement are not considered; and even basic salary factors come into play only after the fact. The sole overt deference to cost occurs in completion of standards program management reports (Air Force Form 498, 1973).[1] These summary reports delineate manpower changes due to the standard over three fiscal years--i.e., changes at each pay grade level. Each such change (e.g., six fewer E-6 personnel) is multiplied by

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[1] See AFR 25-5, Attachment 23.

the corresponding average salary factor, and the products are summed to obtain the total impact on pay.[1] This value, together with any other cost changes occurring due to the standard study (e.g., improved material handling), is compared to the cost of conducting the study to determine the study's "return." At this point the standard manning configurations have already been determined and applied; it is far too late for these or other cost factors to influence choices among manning alternatives.

#### Force Structure Planning

As already noted, force structures are dictated to a considerable extent by manpower requirements projections. But we observe that the objective or target structure for the career force (those airmen beyond the first term of service) is prepared based only on the projected requirements for people at skill levels 7 and 9. The remainder of the force structure plan is filled out by using historical retention and skill upgrade rates and by varying promotion, reenlistment, and accession quantities. Precise agreement between individual specialties' projected requirements at the lower skill levels and the corresponding manpower quantities in the force structure plan, then, should not be expected. Since both the projected requirements and expected personnel behavior (regarding promotion, upgrading, separation,

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[1] We note that other important costs such as technical training, reenlistment bonuses, and retirement benefits--all implicit in the occupational force structures which would appear if standard manning suddenly were employed worldwide--do not appear in this evaluation.

etc.) are based on past experience, however, the disagreement may not be severe. We have not assessed the size of such disagreements quantitatively. It suffices here to note the potential for incongruity between skilled manpower requirements and corresponding specialty force plans.

The dependence of the force structuring process on historical loss rates, upgrade rates, etc. is another prominent feature. Very little effort is made to examine the mechanisms available to influence these rates. For example, the potential effects of reenlistment bonuses on retention rates do not come into play. And although it is felt that promotion policies affect retention rates, the effects of variations in these policies (particularly phase points) are not considered in the enlisted force planning models.[1] Similarly, training program revisions could lead to different skill level upgrade rates, but these possibilities are not considered. The orientation here is very much toward maintaining career progression and total end-strength. And nearly all the flow rates which could be influenced through policy decisions are treated as fixed at their historical values.

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[1] Note: The Airman Force Steady State Model, for example, allows different retention rates for people in the same year of service who hold different pay grades. Thus, the model does incorporate some influence of promotion policy on retention. But potential effects such as the increased "pull" of lowered phase points--i.e., expectations of faster promotions among more junior people, whose retention rates should increase--are not considered.

This tendency to regard things as fixed during the force planning process is even more apparent when we note the static nature of the models employed. The Objective Force Model, the Airman Force Steady State Model, the Five Level Redistribution Program, the CPG Objective Grade Model, and the AFSC Decomposition Model are all stationary or static models. They determine a single, self-sustaining force structure. They make no attempt to capitalize on current manpower availability (i.e., the humps and valleys noted earlier), they take no account of the costs that may be incurred in moving from the present force structure to the objective structure, and they tend to disregard changes in personnel behavior (e.g., revealed through loss rates) and recruitment potential (affected, for example, by a shrinking population in the primary enlistment age group) which may occur during the planning period.

Of course personnel plans address the force structure's progression toward the objective (see, e.g., USAF Personnel Plan, Vol. III, Annex E). But apparently there is little opportunity in making these projections to allow for likely changes in programs, technologies, behavioral patterns, etc. The Promotion Flow Model is the primary tool used for considering enlisted force structure dynamics. Its main use is found in considering the force as a whole, again neglecting specific occupational needs. The model admits little flexibility for considering changes in programs, technologies, behavioral patterns, etc. Although its inputs may reflect such changes--e.g., overall force size need not remain fixed and retention rates may be based on



experience in different years (e.g., 1978 vs. 1979)--they are not considered within the model itself. And the model certainly has no innate capability for controlling force evolution--e.g., by recommending retention incentives or enlisting more people during years of "easy" personnel supply (e.g., due to large enlistment-eligible cohorts or slowdowns in civilian employment growth). At times in the past, policies seem to have been sought which would shape the force structure into the objective form as quickly as possible.

Another factor related to the dynamics of force evolution is the uncertainty of human behavior--even if the behavior-influencing factors are fixed. As noted in Appendix D, for example, the chance that 30 out of 100 people with similar characteristics (e.g., specialty, years of experience, education, sex, pay grade) elect to leave the Air Force in a given year--even if the underlying loss probability for such people is 30 percent--is quite small (indeed, less than 10 percent). In neglecting such uncertainties, current planning models' projections of the number of people remaining in a cohort after several years are subject to considerable error. Further, the likelihood of error increases for smaller cohorts and especially when loss rates are estimated from fairly limited historical experience.

We also note the relatively minor role played by costs in force structure planning. The major objectives seem to include determining a force structure of a given total force size, meeting minimum requirements for personnel at the highest skill levels, providing equal promotion opportunity for all, and staying

within certain grade structure limitations (i.e., legislative and OSD restrictions, respectively, on the percentages of the force that can be in the top two and the top six pay grades). The planning models are used to accomplish these ends by solving numerous sets of simultaneous equations, basically determining for each specialty grouping the number of people in each year group, skill level, and pay grade--and simultaneously determining the personnel "flows" between cells in a network representation of the force. The TOPCAP approach to cost minimization is basically to minimize the size of the career force. Only the Airman Force Steady State Model acknowledges costs explicitly. Its output may (optionally) include cost estimates for procurement and training, maintenance, retirement, and incentives. But this capability has been "added on" to the basic program and is apparently little used. (And even when used, it cannot influence the model's other outputs.) This model's primary use is for total force planning. Hence, such cost data are not career- or specialty-specific--as especially training and incentive costs obviously should be.

Another adjunct to the Airman Force Steady State Model emphasizes a further shortcoming of the overall force planning process: its neglect for productivity considerations. It is apparent, especially within individual specialties, that certain categories of personnel can be substituted for others, with concomitant changes in force capability. Albrecht (R-2330-MRAL, 1979) examines the substitution potential between first-term and career personnel. In examining 17 Air Force specialties,

Albrecht concludes that productivity increases with experience, and that a redistribution between first-term and career personnel could bring substantial annual cost savings with no loss of overall effectiveness. He finds that, presently, higher skill occupations tend to overutilize first-term labor inputs, and lower skill occupations tend to underutilize first-term inputs. Unfortunately, the Air Force enlisted force planning process does not have the capability to analyze such issues. The process uses no data regarding the relative capabilities/productivities of different categories of personnel. Further, there is no ability to make cost tradeoffs among resource alternatives.

The force structure planning portion also aims to provide a singular output: an enlisted force of a fixed size and with predetermined relationships among its components. This planning process does not routinely identify and evaluate alternative force structures, examining, for instance, the costliness of imposed constraints such as limitations on the proportion of the force that can be in certain grades or requirements that all specialties offer similar promotion opportunities. It does not necessarily identify least-cost or most-productive force structures.

In summary, the force planning process seems preoccupied with career progression. We concur that career progression/promotion opportunity must be preserved, but we believe that more emphasis should be given in the planning process to issues of cost, productivity, and dynamic force evolution.

### ALTERNATIVE OPERATIONAL STRATEGIES

To provide the manpower requirements/personnel objectives subsystem with enhanced capabilities to deal with issues of cost, productivity, and dynamic force evolution, we believe the planning process should be extended in two dimensions. First, systematic means should be developed for identifying alternative unit manning configurations. Second, force planning techniques should be devised which can use economic criteria to select among the resulting forcewide manning alternatives (all providing the requisite mission capability) while preserving career progression opportunity. These techniques should provide the capability to identify dynamic force structures which capitalize on current and likely personnel supply and to evaluate the impacts of force structure constraints (e.g., end-strength and grade ratio limitations).

These extensions of the present system would imply numerous differences in its operation. Many of these are noted in the following very brief discussion of these two ideas.

#### Unit Manning Alternatives

The concept and implications of unit manning alternatives can be introduced most conveniently through an example. Let us continue to use the example of the Personnel Records work center introduced earlier. Suppose we are considering an installation populated by 2,000 officers and 10,000 enlisted people; its standard complement for the Personnel Records work center is then 15 persons, categorized as depicted in Figure 5. We have reproduced this standard unit manpower configuration as "Alternative 1" in

Table 6. The table also displays an alternative configuration, "Alternative 2", hypothetically capable of accommodating the same workload. (Note that, probably realistically, the smaller the total unit size, the relatively more senior people required.) If there were, say, two other bases similar to this one, the three could be manned in several different ways with each base using one of these "standard" configurations. Referring to Table 7, we see that providing just two configuration alternatives allows 4 different total force configurations for these 3 bases. Depending on which bases use each unit configuration, a total of 8 different basing alternatives are possible.

Table 6  
HYPOTHETICAL MANNING ALTERNATIVES FOR A BASE PERSONNEL RECORDS OFFICE  
SUPPORTING 2,000 OFFICERS AND 10,000 ENLISTED PERSONNEL

	AFSC	Grade	<u>Manpower Requirement</u>	
			Alt. 1	Alt. 2
Personnel Technician	73270	MSG	1	1
Personnel Technician	73270	TSG	1	2
Personnel Technican	73270	SSG	1	1
Personnel Specialist	73250	SSG	1	2
Personnel Specialist	73250	SGT	4	4
Personnel Specialist	73250	A1C	3	1
Apr. Personnel Specialist	73230	A1C	4	2
			-	-
TOTALS:			15	13

Table 7  
BASING AND TOTAL FORCE ALTERNATIVES FOR THREE SIMILAR BASES WITH TWO  
UNIT MANNING ALTERNATIVES

<u>Basing Configuration</u>	<u>Unit Configuration Alternative</u>			<u>Total Force Configuration</u>
	<u>Base 1</u>	<u>Base 2</u>	<u>Base 3</u>	
1	1	1	1	1
2	2	1	1	
3	1	2	1	2
4	1	1	2	
5	2	2	1	
6	2	1	2	3
7	1	2	2	
8	2	2	2	4

Of course, the number of basing and total force possibilities grows rapidly as the number of unit manning alternatives and the number of bases considered increases. Table 8 illustrates the situation for 10 bases with similar workloads. The alternatives are vastly more numerous when we consider the realistic case of many more bases, most having different workloads. Lest these possibilities seem too numerous, we note that they are tied to very few unit manning alternatives. Apparently, only a few such alternatives generate vast force configuration flexibility.

Table 8  
NUMBER OF TOTAL FORCE AND BASING CONFIGURATIONS FOR  
SIMILAR WORK CENTERS AT 10 BASES

No. of Unit Manning Alternatives Available per Base	1	2	3	4
No. of Total Personnel Force Configurations	1	11	55	220
No. of Basing Configurations	1	1,024	59,049	1,048,576

But how can such alternatives be developed? We believe the USAF Management Engineering Program has the requisite capability. As noted previously, Management Engineering Teams already collect myriad detailed data regarding unit manning and operations. At present, the manhour data are substantially aggregated (the different categories of personnel are not distinguished). One possibility is to collect these data in disaggregated forms or even to employ historical unit manning records (maintained in MPC's automated files). Then, in a manner similar to that employed currently, functional relationships between unit manpower "inputs" and corresponding workload or "outputs" could be

estimated. Other possibilities include conducting surveys to examine personnel tradeoffs (i.e., substituting different categories of personnel for others), analyzing detailed work allocation alternatives, and straightforward reliance on the expert judgment of MET personnel.[1] Development of specific mechanisms for identifying unit manning alternatives is included as a major task in the research recommended in the final section of this paper.

Aside from developing the alternative unit manning configurations themselves, of course, there is the very important practical question of how to select among them. Answering this question requires considering both the force planning and authorization allocation processes--because the structure adopted for an occupation's entire workforce is dictated by the cumulative choices made for individual installations. These choices could be made individually, centrally, or possibly via negotiation. Indeed all of these approaches come into play within the present system: current standards are developed and promulgated centrally (but with local participation), commands choose individually to comply or deviate, and, under the Skills Management System, substantial differences would be mediated by the Air Force Management Engineering Agency (AFMEA). It appears imprudent to advance an answer to this question at this early juncture. The

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[1] It is our subjective conclusion that MET personnel might prefer to specify more than a single acceptable unit manning configuration for each workload. A great deal of effort currently goes into designing "the" configuration, and confidence that the configuration selected is distinctively "best" seems low.



flexibility required by unit commanders and the stability favored by those responsible for personnel planning and programming both must be considered. It may be possible, for example, for commands to select some among (or at least to rank-order) manning alternatives developed for their operating units. These could be aggregated centrally into alternative occupational force structures which would then be evaluated in terms of their attainability, costs, etc. (This brings up questions of force planning; see the next subsection.) Once overall occupational force structures are selected, authorizations could be allocated to coincide as closely as possible to command-specified preferences. The issue here is at once authorization allocation and force structure planning. Its satisfactory resolution could improve substantially the integration between the authorization/assignment subsystem and the manpower requirements/personnel objectives subsystem. By considering different degrees of centralization in authorization allocation authority, considerably different implementations of a planning strategy which incorporates alternative unit manning and force structure alternatives can be envisioned. Whatever the degree of centralization or the form of organizational interaction, the process certainly should address current and anticipated personnel supplies, force structure evolution, and costs.

### Force Planning Techniques

As noted previously, force structure plans for specialty groupings are determined with insufficient regard for manpower costs, dynamics, or mission capability. Attention focuses on historical behavior, career progression, and external constraints.

This emphasis can be changed, however, by taking advantage of unit manning alternatives like those just proposed. The plethora of force configurations arising from these alternatives would constitute a broad set of "solutions" to the force planning problem. They would all have the paramount property of meeting mission-capability requirements. Some configurations, however, would probably be inadmissible, because, for example, they might require unattainable retention rates. Hence, the problem becomes one of searching among these possibilities for a "feasible" and in a broad sense "least cost" force structure. Indeed, in the dynamic case we could imagine a different set of alternative force structures for each year in some planning period. Then the problem is one of selecting consecutive force structures, beginning, of course, with the current structure. In either the static or dynamic case, this selection process would amount to designing forces with appropriate internal structure (flow rates, grade ratios, etc.), fabricating them from the relatively few manning configurations identified for each projected workload. In the dynamic case we would face the additional difficulty of selecting an orderly progression of forces, one that would hold down undesirable fluctuations in promotion policies, training

practices, etc.

A model or system of models which could aid in accomplishing all this is certainly within the state-of-the-art. Jaquette and Nelson (R-1451-ARPA) have developed an optimization model quite similar in concept (though not in form). Theirs is a static and very aggregate approach (e.g., there is no recognition of specialties, skill levels, or pay grades, and force members are categorized only according to their term of service), but it serves to identify the key issues requiring study. Their model assumes the existence of a "mathematical production function" yielding the productive capacity of a given force in terms of its constituent experience profile. The function's purpose is to ensure that at least some minimum productive capability is provided by the selected force. Under the strategy we propose, this capability is guaranteed by constructing the set of possibilities from unit configurations which can accommodate projected workloads. Alternatively we could estimate specific mathematical functions to "fit" the range of possible forces defined by these unit configurations.

Jaquette and Nelson also assume knowledge of "supply functions," expressions recognizing the influences of wage payments, bonuses, and retirement benefits on enlistment and retention behavior. This is in contrast to present USAF enlisted force planning models which regard personnel behavior as fixed. Since force structures obviously can be influenced by compensation, which is variable through bonuses, and since compensation expenditures often may be traded off against recruitment and

training/retraining expenditures, it is apparent that a convenient model of overall costs and associated personnel behavior is needed. Considerable research on these topics is documented in the relevant literature, and it needs to be synthesized and, if necessary, extended to meet present needs.

The sophistication required of the model or models needed to assist in this sort of dynamic, cost-conscious, productivity-preserving planning task is substantial. At first glance it may appear that the computation expense associated with such methods would be exorbitant. But we should recall that numerous models are already in place and exercised regularly in the USAF manpower, personnel, and training planning system. These models already perform many of the calculations required in this alternative approach; it may even be possible to extend them to incorporate these additional capabilities. Barring that, several of them would probably be displaced by new models. Our point is that the computational requirements associated with this alternative planning approach would only be incremental. In addition, we should recall the very large sums being expended to acquire, train, and maintain the personnel force. Deriving force structures costing only a small percentage less than those being planned now and in the future could produce savings dwarfing any additional operational or development costs that might be incurred in the planning process.

Of greater interest should be the additional capabilities and unfamiliar options that would be implicit in this new strategy. It would be possible, for example, to evaluate quickly the

implications of program or technology changes affecting certain work centers, for workload variations or technology-induced unit manning changes would change the set of possible force structures directly. Also, it would be possible to evaluate quantitatively the impact of externally imposed constraints on enlisted grade ratios and reenlistment bonuses. As an example of an aspect which may cause some consternation, it might be possible to identify cost-minimizing force structures which provide the required mission capability--but which do not conform to some prespecified total force size or end-strength. Of course a constraint on end-strength could also be introduced--and hence evaluated.

The essence of these alternative operational strategies is a more direct linkage between the force's productive capability and its costs. The objective is to focus attention on these two aspects within a framework which will preserve career opportunity, vigor, and experience in the enlisted force.

#### IV. CONCLUSIONS AND RECOMMENDATIONS

The conclusions we have reached are presented in this section along with some recommendations for further research.

##### SUBSYSTEM EVALUATIONS

We have found both the authorization/assignment subsystem and the manpower requirements/personnel objectives subsystem to be generally effective. The recruitment, training, crosstraining, and separation activities apparently result in the assignment of personnel to individual specialties in substantial agreement with the approved end-strengths of authorized positions in those specialties. This conclusion bears up over time (recall that our sample data covered a period of nearly three and one-half years). At any given time, only a relatively small number of people were assigned to specialties in excess of those specialties' authorized requirements, and a correspondingly small number of authorized positions were unfilled. Overmanning of specialties was much more common than undermanning. The specialties experiencing significant imbalances between authorizations and assignments at any time, however, tended to experience that problem persistently. This was in contrast to those specialties which accounted for the bulk of the significant shortages or surpluses at any time; their imbalances generally were restored quickly to acceptable levels. That fourth of the sample's specialties which were chronically imbalanced tended to be smaller, exhibit larger trends in their authorized manning, and/or experience relatively more variations in authorization levels. Assignment levels

tended to parallel authorization levels quite well even for these chronic specialties.

We conclude that the personnel "production" process functions rather well. The exception is that when authorization levels change significantly and quickly, or possibly when unexpected fluctuations in retention behavior occur, sizable imbalances can be introduced which take some time to rectify. In addition, we observed that chronically overmanned specialties tend to be relatively more "mission-critical" than other chronic specialties and tend to have longer training times than other specialties. We conclude that many of these AFSCs may be consciously "protected" by ensuring an ample supply of manpower. All in all, aggregate trained manpower resources appear to be provided in quantities quite close to their authorized levels. We have not examined authorization/assignment imbalances regionally (e.g., stateside installations vs. others), organizationally (e.g., differences among commands), or with respect to experience (e.g., as indicated by skill level or pay grade). Imbalances that may exist at these levels may be due, for example, to policies and priorities which cause the assignment system to give "preferential treatment" to some categories of locations. Another contributor is the simple impossibility of always keeping positions filled precisely as authorized. Analysis procedures similar to those used here--including data over an extended period and incorporating thresholds for "significant" and "chronic" imbalances--can be employed to investigate the balance between authorizations and assignments at these more detailed levels. These issues merit

investigation for two reasons: to assess their influence on unit readiness and to determine their implications for the alternative operational strategies advanced in the preceding section.

Our conclusions regarding the manpower requirements/personnel objectives subsystem can also be summarized briefly. We find that the subsystem is somewhat lacking in integration, largely because it lacks mechanisms which focus on costs and productivity. Specifically, it lacks the ability to evaluate possible redistributions of force strength among distinct manpower categories within and between specialties. The requirements determination process generates manpower standards prescribing just one personnel configuration for each possible unit workload, and the force planning process generates just one objective force structure. These processes place considerable emphasis on historical data, basing their calculations, for example, on unit operational experience, past allocations of authorizations, and historical personnel behavior. Routinely, very little opportunity arises in these processes for developing and testing operational and/or policy alternatives which might fundamentally affect the cost-effectiveness of enlisted manpower employment.

These historical data, on the other hand, largely available in automated files, together with existing USAF organizations and expertise provide a very sound basis for extending and improving the manpower requirements/personnel objectives subsystem. We believe that a valuable alternative strategy can be built around the systematic generation of different work center manning confi-



gurations capable of handling the same workload. Only a few such configurations are needed for each workload in order to generate many occupational force structures. These alternative structures then can be evaluated using such factors as costs (recruitment, training, wages, bonuses, separation pay, retirement, and other benefits), career progression (i.e., promotion opportunity), and external constraints (e.g., enlisted grade limitations). All of these are considerably linked to personnel behavior. For example, grade ratio limitations affect promotion opportunities, which, along with cost-affecting compensation practices, influence individuals' decisions to stay in or leave the Air Force.

We also believe that objective overall and specialty force structures should be planned dynamically. That is, the policies which shape them should be formulated by considering current and likely personnel supplies in an orderly evolution.

#### RECOMMENDED RESEARCH

As noted previously, the Air Force itself is examining the distribution of manpower authorizations and assignments. This capability will greatly facilitate assessment of the authorization/assignment subsystem's performance. We recommend that, in addition, efforts be undertaken to examine actual relationships between required or "standard" manpower and these authorization and assignment levels. In promulgating a manpower standard, Air Force management engineers typically report cost differences that would be associated with its application; i.e., they compare average costs of existing and proposed standard manning levels. Such comparisons help to summarize results of a

study effort and, especially when savings are reported, justify the management engineering role. Continued monitoring of the comparison between authorized and standard manning, however, should reveal the impacts the standards actually have on manpower allocation. If allocations are not in agreement with standards, perhaps the views of the responsible commanders and those of the standard-builders do not coincide. In the latter case there would probably be unmet needs for education and/or standard modification. Comparisons between standard and authorized manning might also point out how severely manpower budgets may be limiting expectations of operational capability; i.e., for the cases where authorization levels fall short of standard-recommended manpower. Comparisons between standard manning and actual assignments, on the other hand, should help identify the eventual impact of manpower standards on actual manning and the degree to which operational capabilities may deviate from those required. The regularity and persistence of deviations from standards may indicate whether operating efficiencies are being realized and whether standard revision is required.

We might consider authorized, assigned, and standard manpower as three vertices of a triangle, each pair of vertices joined by a major "activity" within the overall manpower, personnel, and training system. The "personnel" and training portions of the authorization/assignment subsystem are responsible for the triangle's edge joining authorizations and assignments; the objective here is to make assignments consistent with authorizations. The edge joining assigned and standard manpower is the

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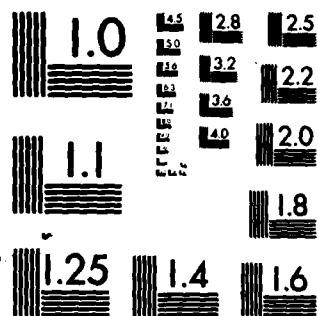
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responsibility of Management Engineering and is a part of the manpower requirements/personnel objectives subsystem; the objective here is to develop standard unit manning configurations which are efficient and simultaneously consistent with current experience in Air Force work centers as they are actually manned and operated. The edge joining standard and authorized manning is the province of commanders at various levels (e.g., unit, base, and major command), operating through the Air Force's "manpower" organization; the objective here is to distribute approved total manpower authorizations so that mission capabilities are best provided. This last activity is the authorization part of the authorization/assignment subsystem. We believe the detailed distribution of manpower resources can be examined best by considering and comparing all three of this triangle's vertices. Ideally, the three manpower specifications should coincide.

More fundamentally, we recommend that the Air Force develop an alternative operational strategy for the manpower requirements/personnel objectives portion of its overall manpower, personnel, and training system. The proposed strategy would be built around methodical specification of alternative manpower requirements; i.e., routine generation of different manning configurations which can handle the same workload, provide the same degree of readiness, etc. These equally-capable work forces should be developed first at the level of individual work centers and then be combined to identify alternative forcewide manning possibilities. These forcewide alternatives can then be evaluated systematically. Factors which must be included in such

evaluations, of course, are costs (recruitment, training, wages, bonuses, separation pay, retirement, and other benefits), career progression (i.e., promotion opportunity), and external constraints (e.g., enlisted pay grade ratio limitations). We recommend that alternative manning configurations be specified first at the unit level because this is where mission capability must be assured. And since costs, career structure, etc. can only be assessed adequately at aggregate levels, we recommend that force plans be developed by comparing alternative forces corresponding to different combinations of the individual unit manpower configurations.

We believe the capability for developing alternative work center manning configurations can be achieved by extending methods currently employed in the Air Force's Management Engineering Program (MEP). This program already embodies an appropriate organizational structure and a technical staff who are accustomed to collecting and analyzing large and detailed data sets. The recommended extension to the management engineering activity would involve explicit evaluation of the relative capabilities of different types of manpower. Differences in functional capabilities and work rates are considered only implicitly in the current standard development process, and methods for considering them vary from one standard study to the next. We recommend development of specific methods which can be applied consistently.

We note that the systematic evaluation of alternative enlisted force structures recommended here would also require developmental work. Current planning techniques would need extension to facilitate comparisons of force alternatives by examining their costliness and even their achievability. Personnel force structures may be shaped by altering promotion and upgrade policies, separation practices, grade ratios, compensation rates, eligibility requirements, etc., and it is important in planning practice to be able to estimate the costs and behavioral effects of such changes. We recommend that efforts be undertaken to identify and assimilate relevant previous research on these topics and, if necessary, to extend existing methods so they can be applied directly in analysis of enlisted force planning alternatives.

Adopting these recommended extensions in manpower requirements determination and personnel force planning procedures would undoubtedly involve implementation of some new procedures; e.g., additional methods of data collection, different formats for representing manpower standards, and revised force planning models. Related processes such as program evaluation and authorization allocation also might be affected significantly. Hence we recommend, in addition to the methodological research proposed above, that special attention be paid to the relationships existing between the analytical methods and the organizations which use them and/or their results. Care must be taken to understand the decisions made in those organizations, who makes them, when, using what information, etc. Besides laying groundwork to facil-

itate eventual implementation of revised methods of analysis and ensuring that the methods themselves are designed for practical use, such research is likely to be valuable in its own right. For example it might reveal organizational inconsistencies or problems in communication, decision scheduling, and/or information systems. Identification and correction of such problems can improve the manpower, personnel, and training system's operation using current methods and ease the solution of problems which would be encountered in developing, evaluating, and eventually employing the extended analytical methods.

Finally, we recommend that the methodological extensions be undertaken in a "pilot study" fashion; that is, using selected Air Force functional areas as prototype work centers. These work centers would provide the realistic environment needed for the development and early testing of analytical concepts and methods.

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Appendix A

AUTHORIZATION/ASSIGNMENT SUBSYSTEM  
EVALUATION DATA

The data used in analyzing the authorization/assignment process include training times, first-term/career ratios, and authorization and assignment figures (projected and actual) by AFSC. Data analysis was primarily based upon the authorization and assignment information. This information was collected from records maintained by the (then) Military Personnel Center (MPC), Airman Assignments Branch, Randolph AFB, Texas. The information was presented in the format shown in Figure A.1. For each AFSC, MPC tracks actual authorizations (derived from the "7102 File") as well as the six-month projections, and it also tracks actual and projected assignments (the actuals represent duty assignments). The records are kept by month and were available from January 1974 through May 1977. This information was coded into a computer format compatible with SPSS.[1]

Some of the MPC data were incomplete in that several months (and in a few cases years) of authorization and/or assignment statistics were missing. Thus, it became necessary to eliminate several AFSCs from the data analysis. Our sample contains 199 out of a total population of 380 AFSCs. These accounted for more than 75 percent of the total authorizations (based upon the authorization level in May 1977, the latest date of data availability when the sample was collected). This sample bias towards

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[1] Statistical Package for the Social Sciences.



large specialties was compensated for by weighting the sample to make it congruent to the total data set.

AFSCs were weighted as follows:

Size of AFSC (Authorizations)	Weight	Percent
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less than 250	2.84	46.4%
250 to 1,000	1.25	20.4%
1,001 to 2,000	1.03	16.8%
greater than 2,000	1.00	16.3%
		-----
		100.0%

This distribution was derived by comparing the frequency distribution of the entire sample (380 AFSCs) with the distribution of the subsample (199 AFSCs) and calculating a relative weight. Each AFSC's size was determined using its authorizations in May 1977 or using the authorizations of the most recent month for which data were not missing.[1]

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[1] USAF Formal Schools Catalog, AFM 50-5, Volume II, September 1976. Eleven of the sample AFSCs were found to be direct-duty assignments, thus requiring no formal training.

Appendix B

CONCENTRATION OF AUTHORIZATION/ASSIGNMENT IMBALANCES

To examine the degree to which the over-and-under-assignments are concentrated in certain AFSCs, we have considered the proportions of our sample exhibiting various percentages of imbalance between authorizations and assignments. Figure B-1 shows that as the degree of imbalance increases, the proportion of observations exhibiting such imbalance decreases rapidly. For example, 37.5 percent (23.4 percent) of the monthly observations represented assignment excesses (shortages) of at least 5 percent, while only 7.1 percent (2.1 percent) of the observations showed excesses (shortages) of at least 20 percent. We have elected to define significant imbalances as those of at least 10 percent.

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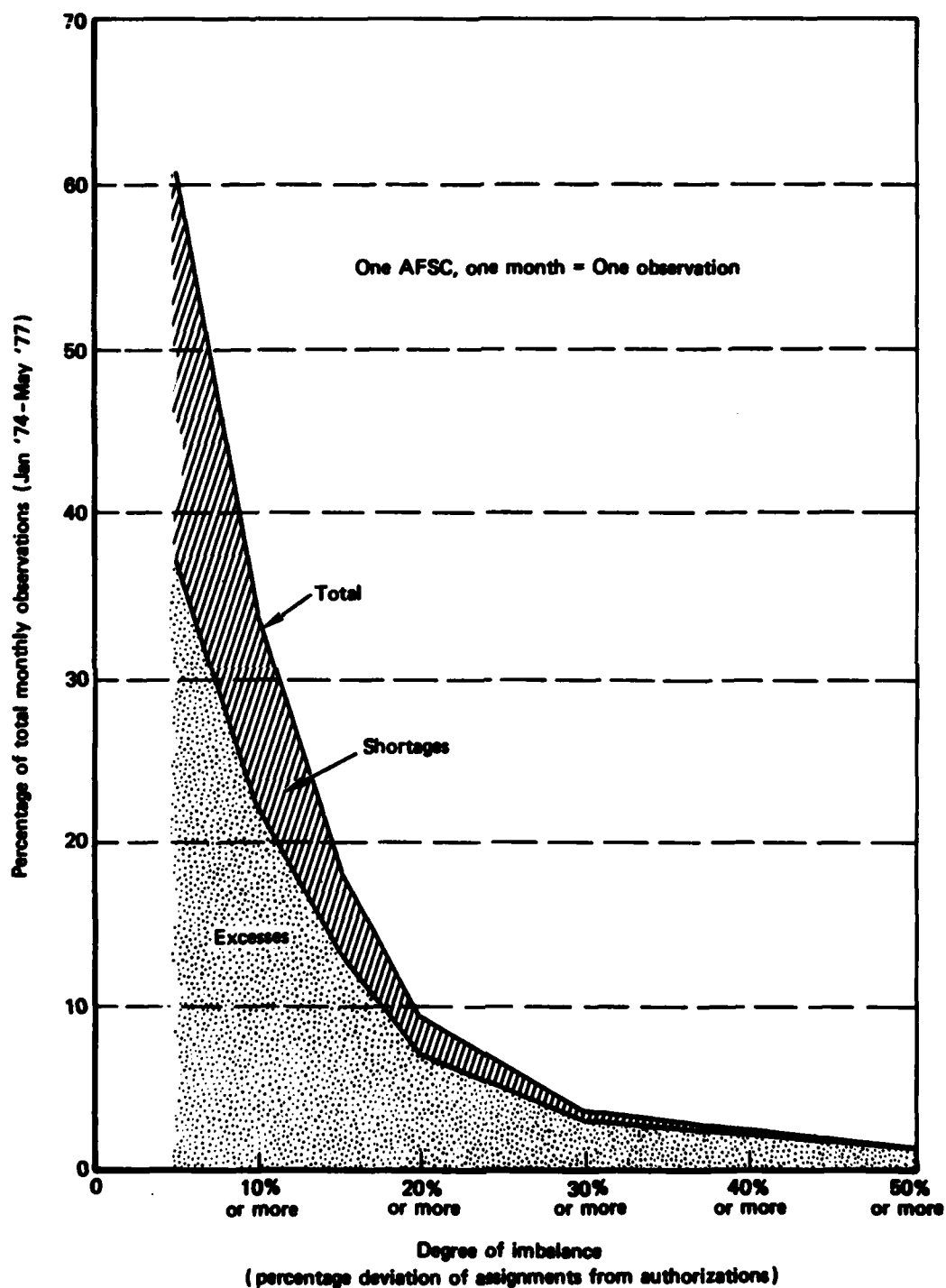


Fig. B-1 — Percentages of the sample exhibiting specified amounts of authorization-assignment imbalance

## Appendix C

### MONTHLY IMBALANCES OF AT LEAST 10%

Figure C-1 depicts the proportion of each month's observations exhibiting assignment excesses and shortages of at least 10 percent.[1] Apparently there is considerably more variation in the percentage exhibiting excess than in the percentage exhibiting shortages.[2] Indeed, although the regression-determined trend lines for both kinds of imbalance are depicted in the figure, only the trend line for shortages represents a statistically significant change over the 41-month period. Specifically, we can estimate an average monthly decrease of about 0.08 percent in the percentage of AFSCs exhibiting shortages of at least 10 percent. Technically, we can reject the hypothesis of there being no significant change at the 95 percent confidence level. This amounts to an estimated reduction of almost 3.3 percent in the proportion of AFSCs showing significant shortages over the nearly three and one-half years covered by the data (a change from 12.9 percent to 9.6 percent). The text's Table 2 displays the mild smoothing effect introduced by using six-month aggrega-

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[1] Our data base did not contain both authorization and assignment quantities for all forty-one months for every AFSC. Either one or both of these quantities was missing for about 15 percent of the weighted sample; thus different numbers of AFSCs may be represented each month.

[2] Cyclic patterns can be discerned in the overmanned AFSC percentages. These are considered later in a discussion of imbalance causes.

tions.[3] of monthly data; the table can be interpreted much the same as Figure C-1.

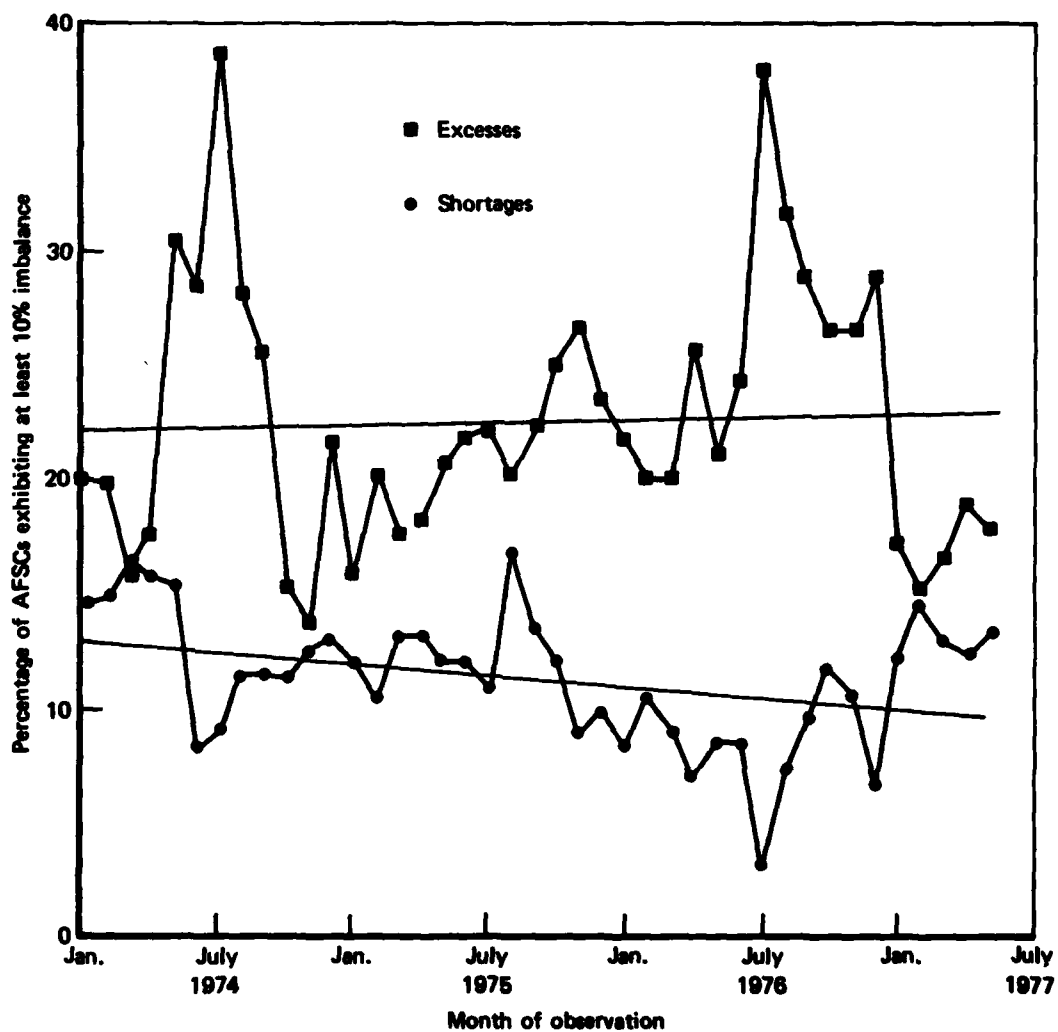


Fig. C-1 — Fluctuations in the percentages of AFSCs exhibiting 10% assignment imbalances

[1] Obtained by determining average authorization and assignment levels for each AFSC and for each semiannual period.

## Appendix D

### CHARACTERISTICS OF CHRONICALLY IMBALANCED AFSCs

We have examined several hypotheses regarding the AFSCs exhibiting chronic and non-chronic imbalances. Tables D-1 and D-2 present relevant summary statistics.[1] Table D-1 contains information relevant to our a priori expectations regarding the size, turnover, and training time. We observe that chronic AFSCs did tend to be smaller than others, but that higher turnover and longer training times did not characterize chronic AFSCs (except that average training time for chronically overmanned AFSCs was significantly longer, statistically, than for non-chronic AFSCs.) Table D-2 displays information relevant to our notions about changing authorizations. We observe that chronically imbalanced AFSCs did experience relatively more authorization fluctuation than others. Specifically, the variation in authorizations for chronic shortage AFSCs was about 50 percent greater than that for non-chronic AFSCs. The variation for chronic excess AFSCs exhibited even more marked variation: about 170 percent greater than for non-chronic AFSCs. All these variations are considerably reduced, however, if we remove the "predictable" variation due to continuing trends in AFSC size

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[1] Note that the "chronically unstable" AFSCs (i.e., those whose significant imbalances are equally divided between shortage and excess situations) are not represented in these calculations. The small number of such AFSCs and special aspects of their management and available data led us to omit them.



Table D-1  
CHARACTERISTICS OF AFSCs BY CHRONIC CATEGORY

	Category		
	Chronic Shortage	Chronic Excess	Non Chronic
Percent of AFSCs	6.5	18.6	73.0
Percent of Authorizations	2.0	9.5	87.8
Average Size of AFSCs*	426	724	1707
Average Percent First Term	40	52	44
Average Training Time (In Weeks)	9	14	13

\*The average number of authorizations per AFSC

Table D-2  
VARIATION IN AUTHORIZATIONS OF AFSCs BY CHRONIC CATEGORY

	Category		
	Chronic Shortage	Chronic Excess	Non Chronic
Total Variation Within AFSCs*	13.9	25.1	9.2
Trend for Category	0.2	-0.8	-0.3
Variation Due to Trend	6.1	14.9	3.3
Variation about Trend (Total variation less variation due to trend)	7.8	10.2	5.9

\*This is the coefficient of variation in percentage terms (simply the standard deviation divided by the mean, times 100--averaged over all AFSCs in the category.)

changes. Note that chronic shortage AFSCs exhibit an average monthly size increase of about 0.2 percent. Corresponding figures for chronic excess and non-chronic AFSCs are 0.8 percent and 0.3 percent decreases respectively. These trends account for 44 percent, 59 percent, and 36 percent of the authorization variation in the chronic shortage, chronic excess, and non-chronic categories, respectively. This leaves variations (unexplained by linear trends) for the chronic shortage and chronic excess

groups, respectively, which are 32 percent and 73 percent greater than for the non-chronic group.

## Appendix E

### CAUSES OF CHRONIC IMBALANCES

The explanatory nature of several of the characteristics noted in the text and in Appendix D is fairly straightforward. For example, electronics and aircraft/systems maintenance specialties, because of their direct association with the USAF's raison d'etre, have the highest manning priorities and hence are most subject to personnel management "overkill" or overmanning. In a related vein, recall that AFSCs with chronic assignment excesses tended to have longer training times than others. These findings suggest that the personnel management system may be acting conservatively with respect to mission-critical and long-training-time AFSCs. That is, management may be ensuring adequate manpower resources in these AFSCs through extra attention to filling recruiting and training pipelines.[1] Medical specialties, on the other hand, may be victims of the highly competitive civilian sector, which offers extremely attractive opportunity to trained and experienced personnel. Thus, these may be AFSCs which are already receiving special management attention but whose chronic shortages persist because of external pressures.

Our primary intent in this Appendix is to analyze the quantitative characteristics of chronically imbalanced AFSCs previously identified: small size, significant size trends, and

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[1] Of course a complementary explanation is that these AFSCs may constitute more attractive career areas and hence experience little difficulty in accessing and retaining adequate numbers of people.

relatively large variations in authorization levels. Because authorization trends and variations are integrally related, they are discussed first. Manpower demand and supply projection errors are the subject of this appendix's second part. Such errors clearly can influence authorization/assignment imbalances, and, indeed, supply projection errors are likely to be relatively larger for smaller AFSCs.

#### AUTHORIZATION LEVEL VARIATIONS

A closer examination of the trends and variations of AFSC authorization levels reveals that the chronic and non-chronic AFSC categories differed in these characteristics even more markedly than indicated in Appendix D.

#### Trends

Table E-1 summarizes the distribution of AFSCs among four categories of growth rates and the three categories of authorization/assignment balance.[1] We observe that the fastest-growing and fastest-shrinking AFSCs exhibited chronic imbalances much more frequently (Table E-1a), and they contributed the largest amounts to the chronic categories (Table E-1b). For example, nearly half of the fastest-growing AFSCs experienced

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[1] Note that the total enlisted force size was declining by an average of about 0.2 percent per month during the period covered by the data. Thus -0.2 percent is chosen as the central point for dividing AFSC growth rates into categories. We designate AFSCs with average monthly growth rates outside the -0.6 to 0.2 percent range as being either fastest-growing or fastest-shrinking, depending, of course, on whether their growth rates are above or below this range--i.e., above 0.2 percent or below -0.6 percent respectively.

chronic imbalances (and somewhat surprisingly, more than half of those exhibited chronic excesses). Almost half (48 percent) of the chronically overmanned AFSCs, however, were "fast shrinkers," and nearly as large a proportion (41 percent) of the chronically undermanned AFSCs were "fast growers."

Table E-1 (a)

DISTRIBUTION OF BALANCE CATEGORIES AMONG GROWTH RATE CATEGORIES

Monthly Growth Rate	% of AFSCs	% of Group in Each Balance Category		
		Chronic Excess	Non-Chronic	Chronic Shortage
Less than -0.6%	27	34	61	4
-0.6% to -0.2%	35	13	81	7
-0.2% to +0.2%	25	9	89	2
More than +0.2%	13	24	56	21
Overall	100	19	75	7

Table E-1 (b)

DISTRIBUTION OF GROWTH RATE CATEGORIES AMONG BALANCE CATEGORIES

Balance Category	% of AFSCs	% of Group in Each Growth Rate Category			
		Less than -0.6%	-0.6% to -0.2%	-0.2% to +0.2%	More than +0.2%
Chronic Excess	19	48	24	12	16
Non-Chronic	75	22	37	31	10
Chronic Shortage	7	18	35	6	41
Overall	100	27	35	25	13

The causative nature of these findings, although clearly not inviolate, is apparent: it is more difficult to garner adequate manpower supplies for specialties which grow more rapidly, and it is more difficult to trim manpower supplies for AFSCs which shrink most rapidly. Further insight is gained by examining Table E-2, exhibiting results of simple linear regressions of

assignment levels against authorization levels.[1] The first two columns of the table indicate, respectively, that assignment and authorization levels were much more highly correlated for chronically imbalanced AFSCs and that the relationship was more nearly one-to-one for such AFSCs. The table's "elasticity" column represents the average percentage change in assignments accompanying a 1 percent change in authorizations. For example, a 1.0 percent change in authorizations for a chronically overmanned AFSC was matched, on the average, by an assignment change of 0.9 percent. Again, we find better results for the chronic AFSCs: assignment level changes more closely matched authorization level changes--at least in terms of the linear relationship between the two levels.

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[1] All regression results displayed in this paper are based on the simple model  $y(t) = a + bx(t) + cz$ , where  $z$  represents the AFSC's average size (authorizations) over all forty-one months,  $x(t)$  is an "independent" characteristic of the AFSC during time period  $t$  (in this case, for example,  $x(4)$  represents the AFSC's average authorization level during the fourth semi-annual period), and  $y(t)$  is a "dependent" characteristic during time period  $t$  (in this case  $y(4)$  is the AFSC's average assignment level during the fourth semi-annual period). Of course,  $a$ ,  $b$ , and  $c$  are the regression coefficients. Experimentation with a number of other regression model specifications yields entirely consistent results, so we discuss this simple linear form because its interpretation is more direct.

Table E-2

SUMMARY OF LINEAR RELATIONSHIPS BETWEEN ASSIGNMENT LEVELS AND

AUTHORIZATION LEVELS

Balance Category	Correlation Coefficient	Slope of Regression Line	Elasticity
Chronic Excess	.91	1.02	.90
Non-Chronic	.60	.73	.71
Chronic Shortage	.85	.86	1.00
Overall	.66	.80	.78

Such results suggest two possible underlying causes of chronic imbalances: (1) intentional maintenance of imbalances for certain AFSCs and (2) occasional short periods of rapid authorization change (causing sudden significant imbalance between an AFSC's assignments and authorizations) followed by periods in which assignment levels parallel authorization levels but the degree of imbalance persists. The first possibility seems plausible in view of the apparent prevalence of more mission-critical and longer-training time AFSCs among the chronically overmanned specialties. The next section's analysis of authorization level variations casts light on the second possibility.



### Variations About Trends

Table E-3 summarizes the distribution of AFSCs among the categories of balance according to the degree of variation of authorization levels about their trend lines. It can be argued that the linear trends are detectable, statistically, and hence this sort of "steady" change in an AFSC's size is predictable. The variation about these trends, then, measures the extent to which authorization level fluctuations are unexplained by these smooth (indeed linear) trends.[1] The data in Table E-3(a) indicate that AFSCs with higher degrees of variation more often experienced chronic imbalances. (Also, the greater the variation, the more likely that an imbalance reflected shortages.) Table E-3(b) illustrates in more detail the greater authorization-level variability among chronically imbalanced AFSCs. Note that 30 percent and 50 percent of the chronic excess and chronic shortage AFSCs, respectively, experienced variations about trends of at least 4 percent. This compares to only 22 percent of non-chronic AFSCs.

Table E-3(a)

#### DISTRIBUTION OF AFSCs AMONG CATEGORIES OF VARIATION ABOUT TREND AND AUTHORIZATION-ASSIGNMENT BALANCE

Variation About Trend	% of Variation Group in Each Balance Category			
	Chronic Excess	Non Chronic	Chronic Shortage	Total
0-2%	16	79	5	100
2-4%	20	76	4	100
4-6%	24	64	12	100
Over 6%	21	64	15	100

[1] Of course, authorization levels may be changed intentionally in nonlinear ways. For example, new programs may require accelerated and then decelerated growth rates for certain AFSCs, and equipment phase-outs may cause manpower reductions that are not straight-line.

Table E-3(b)  
SUMMARY OF LINEAR RELATIONSHIPS BETWEEN ACTUAL  
AUTHORIZATION LEVELS AND SIX MONTH PROJECTIONS

Balance Category	% of Balance Group in				Total
	Variation-About-Trend Category of:				
	0-2%	2-4%	4-6%	Over 6%	
Chronic Excess	41	29	12	18	100
Non-Chronic	51	28	8	14	100
Chronic Shortage	33	17	17	33	100
Overall	48	27	10	16	100

As noted previously, linear trends in authorization levels explain relatively more of the total variation for the chronic AFSCs than for the non-chronic AFSCs. Such "steady" trends can be recognized and taken into account in the process of projecting manpower requirements. Such trends do not lend substantial support to the common complaint of "wildly" fluctuating authorizations. But the fact that considerably larger variations remain when the effects of linear authorization trends are removed does support this contention. Note, for example, that only about 20 percent of the AFSCs having variations about trend of less than 2 percent were chronically imbalanced, while almost 40 percent of those with such variations over 4 percent were chronically imbalanced. Thus, the difficulties that authorization level fluctuations posed (for the recruiting/training/assignment portion of the system) apparently were not coped with adequately.

In summary of authorization level behavior, we note that both trends and variations about trends were larger for chronically imbalanced AFSCs. Indications (in terms of higher linear correlations, regression slopes, and elasticities) are, however,

that assignment levels tended to parallel authorization levels better for chronic AFSCs than for others. Thus, apparently, sudden changes in authorization levels tended to introduce significant assignment-authorization imbalances. For those AFSCs in which such imbalances were not corrected quickly, assignment levels tended to "follow" authorization levels with persistent proportional imbalances. Such results should not be surprising, however, especially in view of pressures to maintain stability in the "input" (i.e., recruiting, training, and crosstraining) system.

#### PROJECTION ERRORS

The realization that large portions of the variation in authorization levels are due to trends leads us to consider the accuracy of authorization level predictions. Conceptually, we can consider predicted authorization levels as manpower demand projections. If these demand projections are treated as assignment targets, any inherent inaccuracies clearly can contribute to imbalances between authorizations and assignments. Correspondingly, inaccuracies in manpower supply projections--i.e., predictions of the number of people available at some future time point--can also contribute to existence of imbalances. In this section we very briefly review the methods currently used for demand and supply projections and examine certain quantitative aspects of the results and/or methods.

### Demand Projections

As indicated in Section II, actual authorizations are products of the authorization allocation process. This process reconciles "pure" manpower requirements (requirements that are developed without budget constraints) and budgeted or funded manpower levels. Typically, command manpower requirements projections are available earlier than accurate manpower budget estimates. Consequently, early demand projections primarily reflect expected manpower needs, "pure" in the sense of being unrestricted by budget limitations. These expected needs are compiled for the respective bases and commands using management engineering guidelines (engineered standards, statistical standards, and guides) and projected workloads (based on planning documents promulgated at higher DoD and USAF levels). Because of the nature of the authorization allocation process--e.g., budgeted authorizations (and, later, even personnel assignments) are frequently distributed in direct proportion to estimated requirements--there are implicit incentives for base and command managers to overstate manpower requirement estimates. As the point of actual authorization level specification approaches, however, budget limitations exert increasing pressure for downward revision of manpower demand projections.

Demand projections are made three, six, nine, and twelve months in advance of actual authorization specification. For illustrative purposes, and because they are most used in anticipating actual total and trained manpower requirements, we have examined the six-month demand projections statistically. Table

E-4 displays the results of simple linear regressions of actual authorization levels on projected levels; it indicates the extent of agreement between the two. We note that: (1) actual authorizations were predicted more consistently for chronically imbalanced AFSCs than for others (higher correlation coefficients), (2) demand projections were consistently higher than corresponding actual authorizations (slopes of regression lines all less than 1.0), but the overestimation was least for the chronically undermanned (shortage) AFSCs, and (3) actual authorizations were more responsive to changes in projections for the chronically imbalanced AFSCs (higher elasticities for the chronic categories).

Table E-4

Balance Category	Correlation Coefficient	Slope of Regression	Elasticity
Chronic Excess	.87	.796	.818
Non-Chronic	.58	.353	.355
Chronic Shortage	.96	.959	.959
Overall	.63	.405	.409

In total, these findings indicate that demand projections tended to be better for the chronically imbalanced AFSCs than for non-chronic AFSCs. Apparently the demand projection "system" recognizes the existence of "chronic" AFSCs and gives special attention to their manpower needs. This suggests that a mechanism exists in the authorization/assignment system which identifies problem AFSCs and ferrets out relatively more of the demand projection bias introduced by (1) early separation of "pure" manpower requirements and budget level projections and (2) tacit incentives for manpower-using organizations to overestimate manpower needs.

To examine this issue more closely, consider Table E-5. This table relates actual AFSC assignment levels to six-month authorization projections. The results are again favorable for the chronically imbalanced AFSCs: (1) assignment levels were more highly correlated with demand projections, (2) assignment levels were consistently lower than authorization projections (the slopes are less than 1.0) but less so for the chronic AFSCs, and (3) changes in assignment levels were more responsive to changes in demand projections. We conclude that the authorization/assignment system recognizes the existence of chronically imbalanced AFSCs, takes the manpower demand projections for these AFSCs more seriously, and manages assignment levels for such AFSCs so that they more nearly parallel demand projections.

These findings are also manifest in Table E-1; recall, for example, that actual assignment levels and actual authorizations were more highly correlated for chronic AFSCs. Hence, as a general statement, we may conclude that the authorization/assignment subsystem, although it recognized chronic AFSCs and reacted appropriately, simply fell behind some of those AFSCs' authorization targets and had difficulty making up the discrepancies.

Table E-5  
SUMMARY OF LINEAR RELATIONSHIPS BETWEEN ACTUAL ASSIGNMENT  
LEVELS AND SIX-MONTH AUTHORIZATION PROJECTIONS

Balance Category	Correlation Coefficient	Slope of Regression	Elasticity
Chronic Excess	.92	.936	.851
Non-Chronic	.41	.303	.298
Chronic Shortage	.86	.869	1.000
Overall	.86	.383	.374

#### Supply Projections

One might suspect that predictions of available manpower supply--i.e., the number of people available within an AFSC at some future time point--might be made, arbitrarily, to agree with predictions of manpower demand. Of course such "fudging" would serve no useful purpose, and indeed it apparently does not occur. The Air Force employs quite sophisticated supply projection methods, for example, in its Airman Skill Force Program and its Trained Personnel Requirements Program,[1] designed to project airman losses, reenlistments, etc., even on a monthly basis, for individual skill specialties, and for up to four years into the future. These refined projections form the basis for personnel policy decisions regarding recruitment, training, and retraining quotas, reenlistment bonuses, proficiency pay, etc. Projections are based on historical retention rates and current personnel resources in specific categories.

[1] See USAF Personnel Plan, Vol. VI, "Personnel Programming System," Section 2.



Unfortunately, such refined personnel supply projections are not a part of our data base. The projections in the USAF Military Personnel Center (MPC) records (see Appendix A) are for entire AFSCs and apparently are very crude. Specifically, these estimates are based on assumptions that (1) all career force personnel in an AFSC will be retained and (2) all first-term personnel in the AFSC will be lost. Such estimates could hardly be expected to predict actual manpower supplies accurately. (And, as we have verified statistically, they do not.) Fortunately, however, these particular projections seem to be used for little more than "completing" a large data file.

Although we lack specific data for use in evaluating manpower supply projections, we can point out one aspect of the estimation process which may inhibit achievement of authorization/assignment balances. This aspect is the apparent neglect of simple random variation in human behavior. To illustrate, consider a cohort of 100 individuals (similar in terms of specialty, grade, age, sex, etc.) facing a decision of whether to leave or stay in the service. Suppose history indicates that an average 70 percent of such individuals elect to stay in the service. Only rarely will exactly 70 people in such a cohort elect to stay in service in any given year. Indeed, if we assume that each individual acts independently and makes the stay-in decision with a 70 percent probability, it is easy to verify that the chances are greater than one in six that the number who actually stay in differs from 70 by at least 10 percent. If the cohort contains only 50 people, the chance of actual retention differing

from 35 (i.e., 70 percent of 50) by at least 10 percent increases to more than one in five. And if the cohort contains only 20 people, the chance of a projection error of at least 10 percent becomes almost one in two; that is, on average, a retention estimate of 14 would be off by at least 10 percent about half the time.[1] Considering the relatively small personnel groupings for which distinct retention rates are estimated,[2] it is safe to assume that personnel supply estimates are frequently based on cohorts of approximately these sizes. Hence, simple point estimates of subgroup retention quantities should be expected, fairly often, to err substantially.

Figure E-1 illustrates the prevalence of smaller AFSCs among the chronically imbalanced. For example, compared to the non-chronic category, the two chronic categories contained approximately twice as large a proportion of AFSCs with fewer than 251 authorizations. We note further that 36 percent of the AFSCs with average authorizations under 500 appeared in the chronic categories as compared to only 18 percent for those with authorizations over 500. Generally, the smaller the AFSC, the smaller

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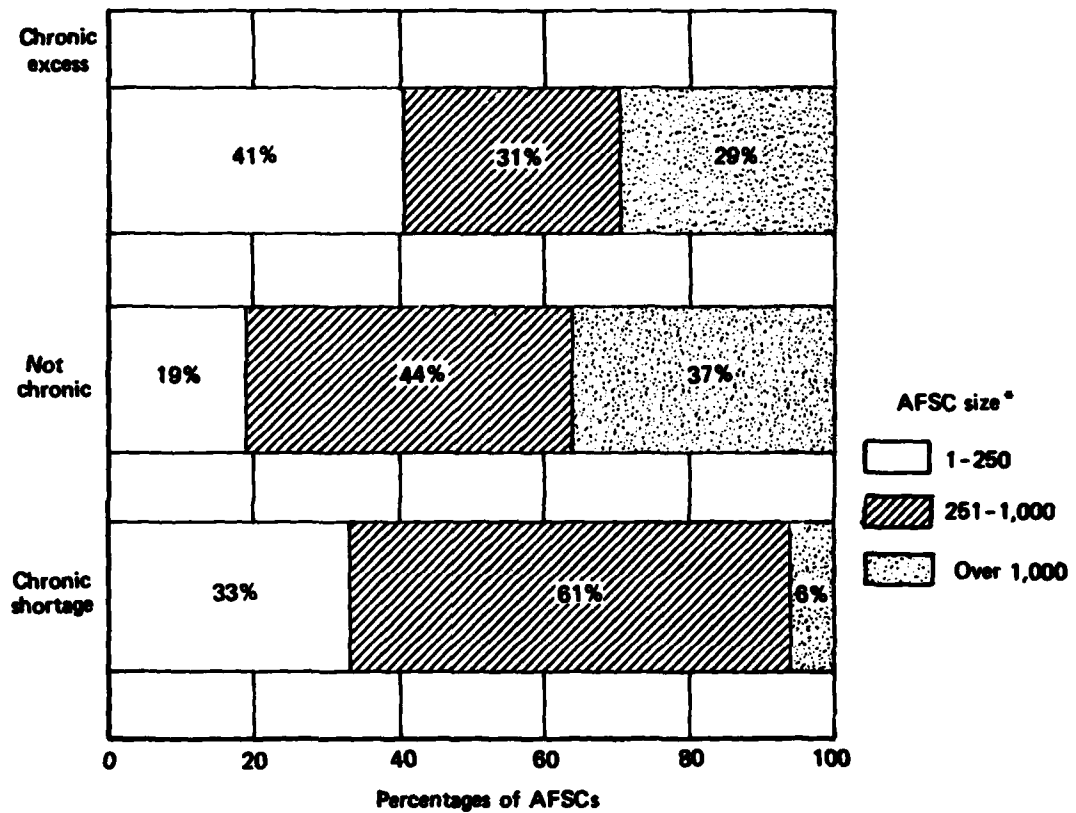
[1] It is interesting to observe that these error probabilities increase substantially if the 70 percent retention rate, say, is based on a "short" history--i.e., on a relatively small number of observed stay-leave decisions. The error probabilities also increase rapidly as the retention rate itself diminishes: for example, the chances of at least a 10 percent projection error with a 30 percent retention rate are 59 percent, 65 percent, and 81 percent respectively, for cohorts of 100, 50, and 20 individuals.

[2] See, for example, John D. Maybee, "Forecasting Airmen Losses and Reenlistments -- the Methodology and its Applications," USAF Personnel Research and Analysis Division, the Pentagon, May 1972.

are its constituent cohorts, and the more likely become significant retention estimate errors.

Our initial empirical investigations indicate, however, that the likelihood of significant error in predicting an AFSC's total short-term retention quantity is fairly low. This is because relatively few people in an AFSC pass a point of substantial attrition during each short-term planning period. Typically, only about 12 percent to 18 percent of enlisted personnel are in their fourth or twentieth years of service, the years with lowest retention rates and hence primary potential for contributing to supply projection errors. Of course different AFSCs have different distributions of personnel among retention categories (such as years of service); smaller AFSCs with relatively larger fractions of individuals at stay-leave decision points are subject to larger likelihoods of significant retention projection errors. Our data base, unfortunately, does not include detailed AFSC historical profiles or retention rate estimates, so we are unable to assess the extent of such projection error and its causative impact on authorization/assignment imbalances. Our intent here is simply to emphasize the existence of this kind of supply prediction error and to note that it may account at least partially for the predominance of smaller AFSCs among the chronically imbalanced.

We must note that retention estimates are only one part of an AFSC's manpower supply projections. New personnel are continually being recruited and trained, in addition to crosstraining of individuals from other skill classifications. Typically,

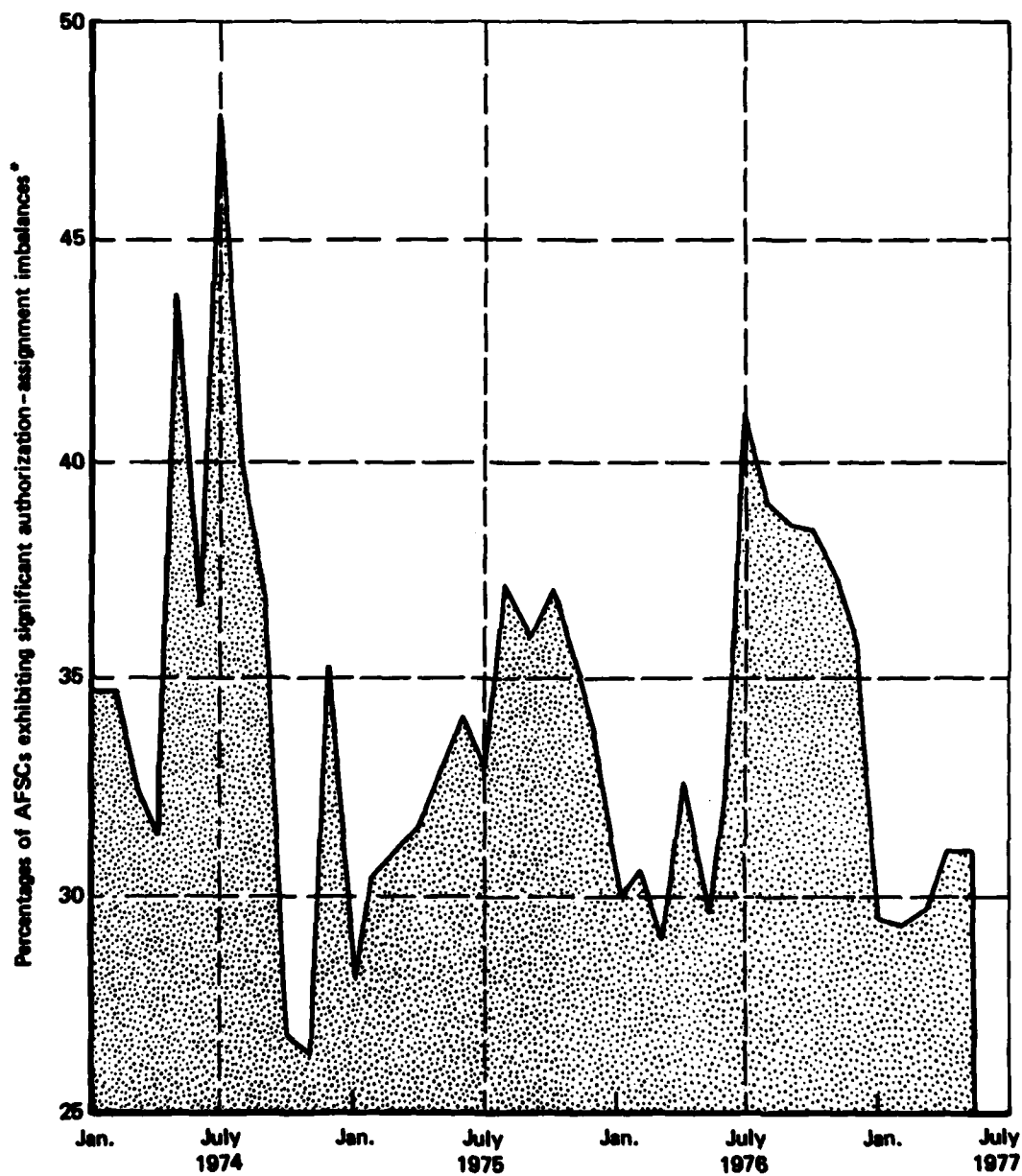


\* Ave. monthly authorizations  
Jan. '74-Man '77

Fig. E-1 — Distribution of AFSC sizes within categories of imbalance

from 10 percent to 20 percent of the enlisted force is first-year personnel. Recruitment and successful training of this significant manpower component are also subject to some random variation, and errors in projecting available supplies of new personnel are unavoidable. In addition, since requirements quotas for new personnel are based on retention quantity predictions (and projected workloads, of course), occasional shortfalls in accessions might coincide with periods of lower-than-expected retention, resulting in an AFSC's assignment level being considerably below its authorization level. Efforts to maintain stable induction and training rates, then, just as noted previously in relation to imbalances caused by sudden authorization level changes, tend to permit only rather slow correction of such imbalances.

Finally, we note the significant seasonality of manpower supply and its relationship to authorization/assignment imbalances. Figure E-2 depicts the percentage of AFSCs experiencing significant (at least 10 percent) imbalances in each of the forty-one months (i.e., the total of the excess and shortage percentages in Figure 2). The period of peak imbalance apparently is late summer and early fall each year. This is also the time when overmanning situations are most frequent. Traditionally, early summer (following school graduations) has been a period of peak enlistment, and it is not surprising to find overmanning situations occurring several weeks to a few months later. The time lag, of course, is due to the period of training between enlistment and assignment.



\* Significant imbalances are taken as those of at least 10%

Fig. E-2 — The cyclic pattern of significant imbalances

Appendix F

EXCERPT FROM AFR 39-1 [1]  
REGARDING CLASSIFICATION CHANGES

Requesting New or Revising Existing AFSs:

- A. It is essential that the classification system accurately reflect technical, operational, and procedural developments in the Air Force. Review of skill requirements and classification by individual commands and Hq. USAF Air Staff officers is a continuing responsibility. As existing classification becomes obsolete or developments occur which require new or revised Air Force-wide skill identification, Hq. USAF DCS/Manpower and Personnel, should be advised. Modification of existing classification has a significant effect on all facets of Personnel Management. Therefore, recommended changes must reflect understanding of the Personnel Classification Concepts set forth in AFR 35-1, and provide sufficient data for analysis by Hq. USAF.
- B. Submit recommended changes, additions, or deletions to the existing classification provided in this regulation through channels to HQ AFMPC/MPCRPQ, Randolph AFB TX 78148.
- C. Recommendations for changes to AFSCs, prefixes, or suffixes must include the following essential information:
  - 1. Brief description of proposed change. Show its relationship to the existing classification structure, consistent with personnel classification concepts of AFR 35-1.
  - 2. Rationale for change. Include reasons why existing classification is inadequate.
  - 3. Description of duties and tasks:
    - a. Describe duties and tasks; include details of systems, equipment, special tools, or materials involved.
    - b. Include details of knowledge, education, and experience required to perform duties and tasks.
  - 4. Evaluation of training requirements:

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[1] Effective 15 October 1978 AFR 39-1(C4) 15 September 1978.

- a. Include evaluation of existing courses, need for new courses, and estimated on-the-job or formal training time.
  - b. Categorize training as "desirable" in all cases except where OJT is judged impossible or permanently uneconomical and operationally unfeasible.
5. Detailed summary of personnel and/or manpower impacts:
- a. Estimate the number and organizational level of positions which would be identified by the proposed classification.
  - b. Estimate the number, location, and AFSC of manpower positions which would be deleted and/or added.
  - c. List AFSCs of personnel currently performing duties included in proposed classification, and estimate number by AFSC that would convert to the new AFSC, if established.
6. Recommendation on desirability of conducting a specialty survey under AFR 35-2 for proposed classification.
- D. Recommended changes, deletions, or additions to SEIs must contain the following information:
1. Brief description of proposed change.
  2. Brief rationale for change.
  3. Requests for new SEIs should contain:
    - a. Details as to length of experience and training or education essential to qualify for designation of the SEI. Include details of when the SEI should be considered for withdrawal.
    - b. Career fields and AF specialties to be authorized for use with the SEI, and an estimate of the number of personnel to be identified.
  4. Recommendations concerning existing SEIs must refer to the present SEI code number. These codes appear in AFR 39-1 and AFM 300-4.

NOTE: Recommended changes to this regulation must arrive at HQ AFMPC/MPCRPQ, Randolph AFB TX 78148, per the following time schedule:

1. Not later than 28 February for the change to become effective the following October.
2. Not later than 31 August for the change to become effective the following April.



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BY ORDER OF THE SECRETARY OF THE AIR FORCE  
OFFICIAL

JAMES J. SHEPARD, Colonel, USAF  
Director of Administration  
DAVID C. JONES, General, USAF  
Chief of Staff

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